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EDHEAD

100% independent - that's us

Something's been bugging me a little bit recently. And it occurs to me that I've got the perfect place to get it off my chest.

Right here.

Here's the thing – a lot of people who read this magazine, and our web site, believe that there is an inherent and inviolable level of what can only be called corruption that is part and parcel of the reviewing and writing of a lot of content, at a lot of outlets. Some of these people even think that Atomic's no better, that our advertisers and commercial partners perforce have the power to influence things like review scores and inclusion in things like KitLog or even the Atomicans' Choice Awards. I hear this from readers via email, from folks on the forums, and occasionally even other vendors.

Well, straight up, I want to say this as officially and as publically as I can: this *does not* happen. It is not how Atomic operates, and it's certainly never going to happen on my watch. Every opinion, score, review or belief you read here and on our site is ours, and no one else's. We write and review without fear or favour, independent of advertisers or any other commercial consideration.

That's my promise, and that's a big part of Atomic's mission statement.

Phew - that's better. I feel all relaxed now. Time to play some more Deus Ex: Human Revolution...

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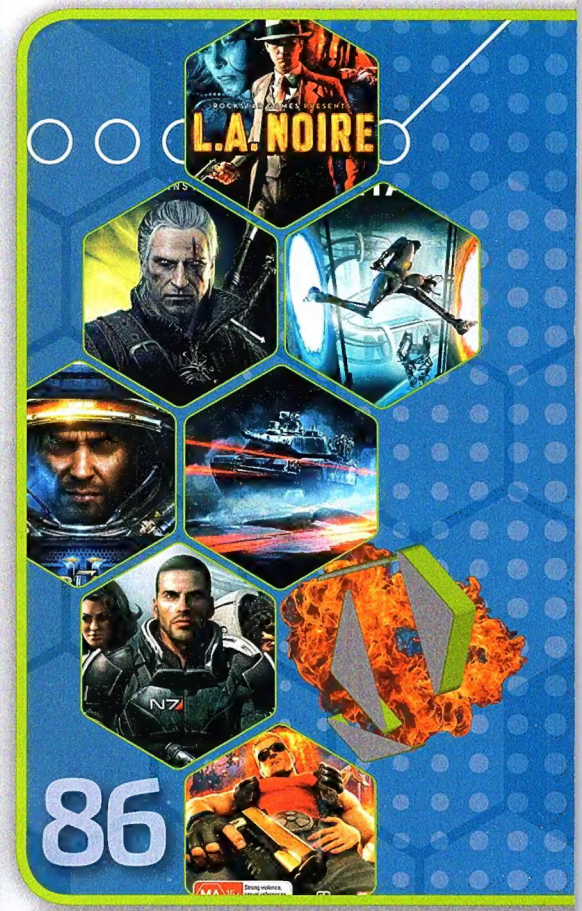

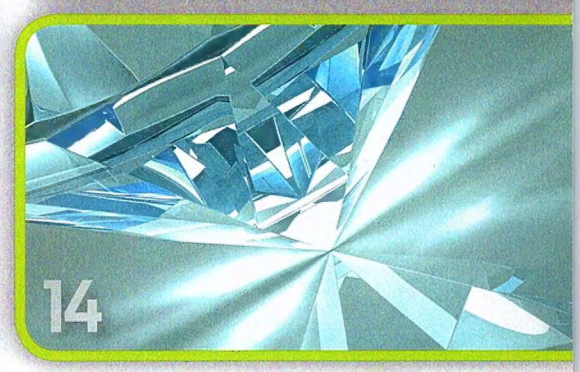

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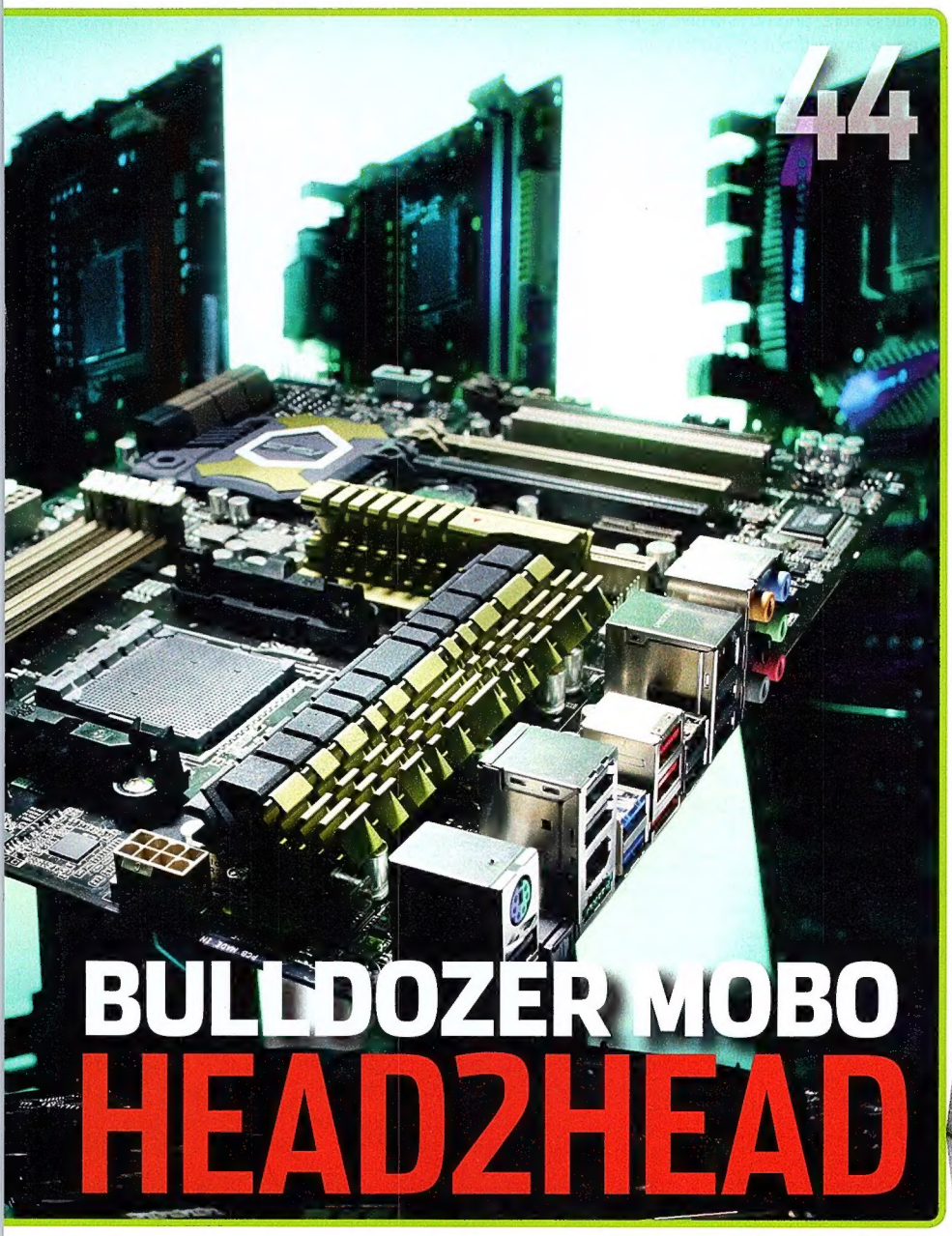

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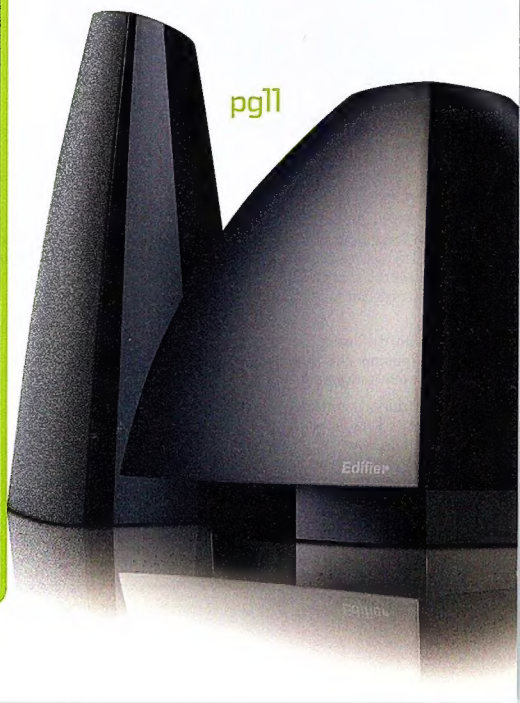

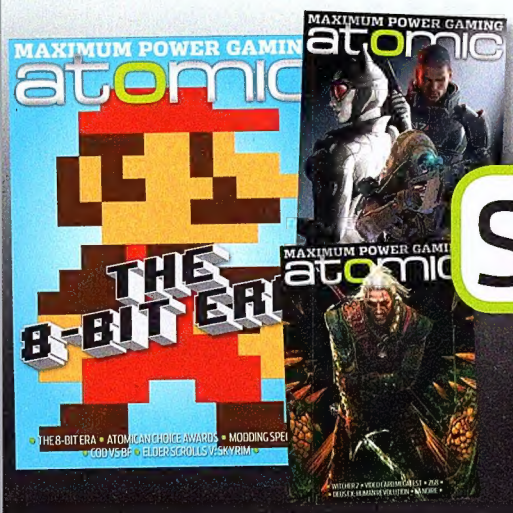

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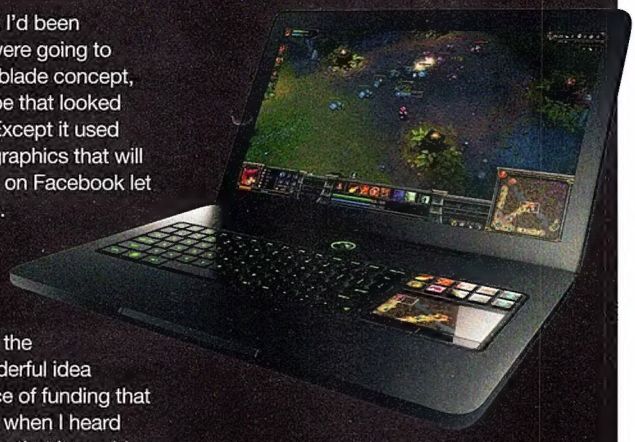
Razer gets into the laptop business with Blade

OPINION: Razer's hyped Pax Prime announcement is of a new laptop with Mac-killing looks and a pricetag to match. John Gillooly comments.



My hat is off to you Razer. I'd been wondering just how you were going to commercialise the Switchblade concept, a tiny PC gaming prototype that looked and sounded awesome. Except it used an Atom processor, with graphics that will struggle with Randomville on Facebook let alone a big persons game.

Don't think the fact that every switchblade press release focused on China passed us by. As is sadly the case in the PC world, this was a wonderful idea hobbled by the very source of funding that created it. All I could think when I heard about the Switchblade was that it would kick serious butt with a Fusion APU from AMD, which would be able to handle the graphics a lot better.

I honestly didnt expect the switchblade to do anything other than fuel chinese mmo addiction. So good on you for taking the technology and building the Blade, a gaming laptop. Or as Razer claims 'The world's first true gaming laptop'. I'm calling bollocks on that btw, if anything Alienware has been there since Razer were first trying to convince people that wide buttoned rodents named after snakes were cool.

The Blade packs a Core i7-2640M CPU, which is a lot more capable than the Core i7 2620QM processors that normally appear in mobiles. It also has Nvidia's current top-end GeForce GT555M, which already appears in more serious gaming laptops like those from Alienware. It has 8GB of DDR, which sounds impressive until you look around and realise that RAM is currently cheap and a lot of the laptops on the market in Australia already have 6GB or 8GB as standard. 320GB of hard drive is bearable in a normal laptop, where you can expect to use external drives to handle the storage, but in a gaming laptop it means you need to keep the size of your installs in check.

Much like Razer's Hydra motion controller this all sounds wonderful, and then comes the price. The anti-macbook looks of the Blade come at a monstrous pricetag of $US 2799. That's getting up to Vaio Z with its Lights-Peak based external GPU level of extravagance, and you can get laptops of similar spec for much, much less.

Plus I can't help but wonder if this would be so much better (and cheaper) with an APU and Radeon dual graphics setup.

I do not doubt that a massive amount of engineering has gone into the design, and that the customisable Switchblade UI costs a bit of cash, but if you want to stand up for PC gamers don't launch a product that is priced the same as ten consoles currently are. where we suspect the cost comes in is in the chassis. I recently chatted with ASUS about its upcoming macbook air competitor, the UX31, and was stunned to find out that chassis yields for unibody designs were actually quite low.

While the blade is certainly a luxury product, it is one of the few laptops we have seen that can seriously compete on looks. Sony tends to get it, Samsung and ASUS are creeping towards getting it right, but Razer has come straight out of the blocks with a design that just works.

Apple has proven that people will pay for design, but can Razer manage to do the same?

FROM ATOMIC ONLINE

So how does the cookie crumble this month. Who's post, as they say, reigns supreme (and wins a handy-dandy Razer Hydra/Portal 2 bundle)? Drum roll, please?!!

It's **GhostWhoWalks**, and his wonderful tale about how gaming made him who he is today. Bravo, and fire us a PM with your deets so we can deliver some sweet, sweet Razer-flavoured love (wait, that sounds bad...).
http://forums.atomicmpc.com.au/index.php?showtopic=44488&st=0&p=894335&#entry894335

We also have a few runners' up worth praising...

g__day, and his incredible tale of survival and getting better.
http://forums.atomicmpc.com.au/index.php?showtopic=44278

orcone delivers some illustrative Illustrator knowledge.
http://forums.atomicmpc.com.au/index.php?showtopic=44232&st=0&p=889653&#entry889653

And **physt** challenges us with a real-world tactical problem.
http://forums.atomicmpc.com.au/index.php?showtopic=44292

Awesome - give 'em a round of applause!

MODIFICATION

With Ashton "Two mods are better than one" Mills.

New vision and HDTP

Game Deus Ex (original)
URL www.moddb.com/mods/deus-ex-new-vision, offtopicproductions.com/hdtp

With Deus Ex: Human Revolution free and running wild, now is as good a time as any to play the original Deus Ex – if you were somehow living under a boulder or abducted by aliens when it first hit the scene, that is.

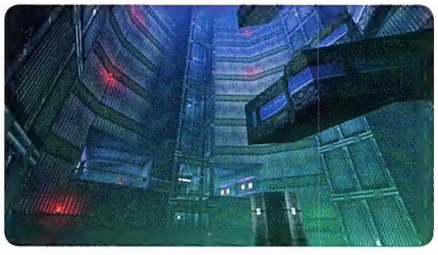
While it was 11 years ago, an aeon in computer gaming (and about jolly time for a sequel to arrive), these mods hope to recapture what the sequel, Deus Ex: Invisible War did not.

The two mods address what most needs addressing when we look back 11 years – the graphics and engine. Despite its age, the original Unreal 1 engine was quite capable and could support much larger textures than the original game included (keeping in mind games had to consider limited amount of video RAM compared to today).

New Vision is one of those labour-of-love mods that's been four years in the making and was only completed this month. It overhauls almost all the textures in the game, replacing them with higher resolution alternatives. It also bundles a new DirectX 10.0 renderer, which brings with it HDR and bump mapping, world building and models.

Despite its age, the original Unreal 1 engine was quite capable and could support much larger textures than the original game included...

And that's where HDTP, the High Definition Texture Project, comes in: it complements New Vision with remodelled and retextured NPCs and objects, especially the game's weapons. While not complete, and never will be (work stopped many years ago on HTDP), together the mods rejuvenate this classic game. Be sure to install the New Vision hotfix as well as the release package, then install HTDP.



Flash's Mass Effect 2

Game Mass Effect 2
URL www.moddb.com/mods/flashs-mass-effect-2-mod1

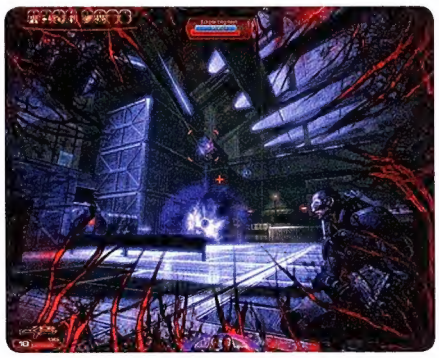
Mass Effect and its sequel stand on their own as brilliant games, but no matter how great a game may be there's always room for improvement. Some mods aim to bug fix or subtly alter the gameplay in line with a slightly different vision, while others are more extensive overhauls. Flash's mod falls into the former, with some simple but insightful changes.

One core motivation of the mod is to reduce the time spent on the annoying scanning mini-game, but it also makes balance changes to bring ME2 more in line with ME1's gameplay values.

Highlights of the changes include shields no longer blocking powers, enemy shields being able to recharge just like Shepard's (removing the unfair advantage this gives the player versus enemies), reduced health regen rate to encourage use of medigel, and making ingame cinematics skippable. It also changes Jacob's loadout to be more useful with an assault rifle and heavy pistol, and throws in the top 50 Shep and FemShep face presets from **masseffect2faces.com** for good measure.

The changes aren't extensive, but are enough to tweak the gameplay for the better. Some of the best mods are those that just make small, significant changes.

The author, Flash, is well known for his combat rebalance mod for The Witcher, which is generally considered essential for the game – and so good, in fact, that it landed him a job at CD Projekt RED. So if you've somehow not managed to play Mass Effect 2 yet, or you're up for a replay in anticipation of Mass Effect 3, Flash's mod would be a worthy addition.



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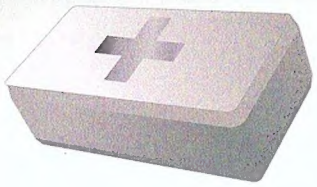


Starpoint Gemini Patch v1012

Pirates of Black Cove Patch 3

The Sims 3 Patch v1.22.9 to v1.24.3

World of Tanks Patch v0.6.5 to v0.6.6

The Sims 3 Patch v1.22.9 for Mac OS X

Splinter Cell Patch 1.2b [US]

GEARBOX

All the coolest gadgets & gear.

Level Up Xbox360 Zig Zag Storage Tower

Price: $49 **Website:** www.dicksmith.com.au

There are two kinds of gamers in the world: those who like to keep their gear hidden and out of the way for when 'normals' come to visit, and those who wear their passion proudly on their sleeve – or lounge room wall, as the case may be. Ok, there is a third type – those who attempt to keep everything organised but are just way, way too lazy to actually do so – but they (we) are likely beyond help.

The ZigZag storage tower is squarely aimed at the gamer who likes to put it all out there. It has a distinctly display-case look about it, with the Xbox itself influencing every single aspect of the styling. On a more practical level, it'll make sure your Xbox, controllers and your most-played games are right there within reach whenever you need a hit. Sounds good!

Razer Mouse Bungee

Price: $26.95 **Website:** www.razerzone.com

It's a mouse dilemma gamers have been grappling with for generations: corded or cordless? Cordless is neater and gives us a nice range of movement without anything getting in the way, and we are quite fond of the Microsoft Sidewinder X8, but there are plenty of arguments to be made for the wired rodent also.

If you aren't ready – or willing – to cut the cord, the Razer Mouse Bungee might be right ɔ your alley. It's a little springy suspension device that basically keeps your cord tidy and ˌnag free, and promises to give you the feeling of a wireless mouse without the drawbacks.

It's not new – Mouse Bungee has been around since Hollingworth was a boy (ok, maybe ıot that long!), but they've just recently teamed up with Razer to bring their product into the modern age. And doesn't it just look shmick.

LG Optimus 3D

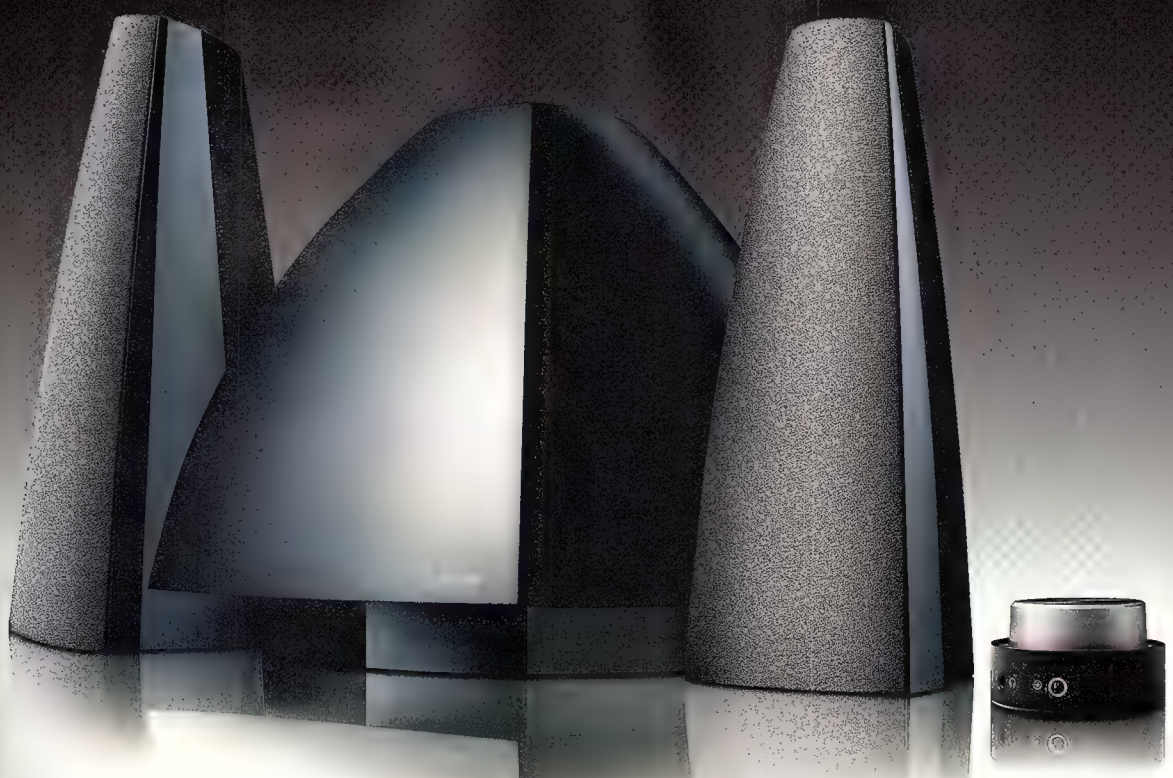
Price: $799 outright

Website: www.lg.com.au

Long, long ago the mission statement – as it were – of this fine publication was 'there will never be a printer review'. And as far as we know, there never has been. Certain other bits of fluff have snuck onto our pages, including cameras and iPad accessories, and now we're skirting the edges of acceptability by featuring, wait for it, a mobile phone. Which we have looked at before, actually.

But this is not just any mobile phone. The LG Optimus 3D is a high-spec Android-powered phone with all the trimmings. It's fast. It's powerful. It's shiny. But that's not what makes it belong on these pages. No – that would be the added 3D capabilities. Because nothing says 'gearbox' quite like a regular, everyday gadget with bolted-on 3D.

The day they release a consumer-level printer with 3D display, we're all in trouble.



Edifier Prisma Speakers

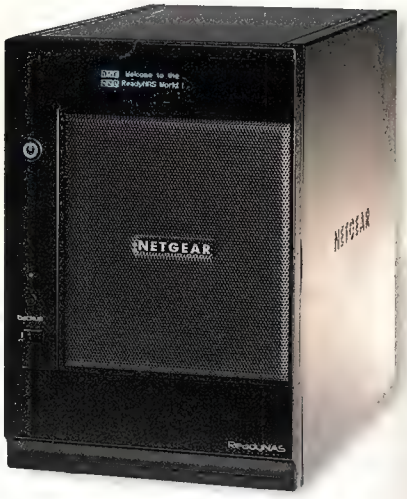
Price: $129 Website: www.edifier-international.com

We're all about good design here at Atomic, and we do think that these Edifier speakers fit the bill when it comes to looking swanky.

What we're not so sure about is their claim that they're inspired by the Sydney Opera House. It may well be true, but the final result is a far more 'dome and spires' than 'sails' – although maybe they look different in white.

In any case, while we might seem shallow and appearance-obsessed, we're really not. And to prove it we will point out that under the domes these speakers feature separate bass and volume controls, a total power output of 9W x 2 + 32W, an auxiliary input jack for your MP3 player, and very fancy red 'halo' lighting when on.

Ok, so maybe that's an aesthetic thing too. We loves us some LEDs.



Kaiser Baas Car Camera

Price: $99.95 Website: www.kaiserbaas.com.au

Regular readers of this magazine may know that we're not very big on driving around here. We're most comfortable in the passenger seat, with our feet up and hands free to play with our techy gadgets. According to some, this makes us bad people. According to us, it's brilliant.

On long drives in particular, as well as the rights to dole out the snacks, we also get to enjoy the scenery in a way that the driver doesn't, because they're too busy paying attention to the road and other vehicles.

That's where the Kaiser Baas Car Camera comes in – this little camera can be mounted on the inside of the windscreen and will record everything that the driver is missing out on, for future watching and/or broadcast and/or blackmail. If you're the kind who likes to document as much of your life as humanly possible, we're guessing this will bring you much delight.

Netgear ReadyNAS Ultra

Price: From $489 (diskless) Website: www.netgear.com.au

You may have heard of Netgear's ReadyNAS before – they've been around for quite a while, and have managed to carve themselves out a pretty nicely-sized chunk of the NAS market.

So we're not here to tell you about the ReadyNAS. We're here to tell you about the ReadyNAS [i]Ultra[/i], which has a whole bunch of newfandangled features that bring it hurtling into the second decade of the twenty-first century. The Ultra features ReadyNAS remote – a set of mobile apps that let your NAS play friendly with your mobile device of choice, be it Android or iOS, phone or tablet, and the creation of something called a 'private cloud' so you can share everything you could possibly want in new and wonderful ways.

Also, the whole range is now cheaper. Which we're rather pleased about.

Bright ideas

Jake Carroll shines some light on how we simulate photons.

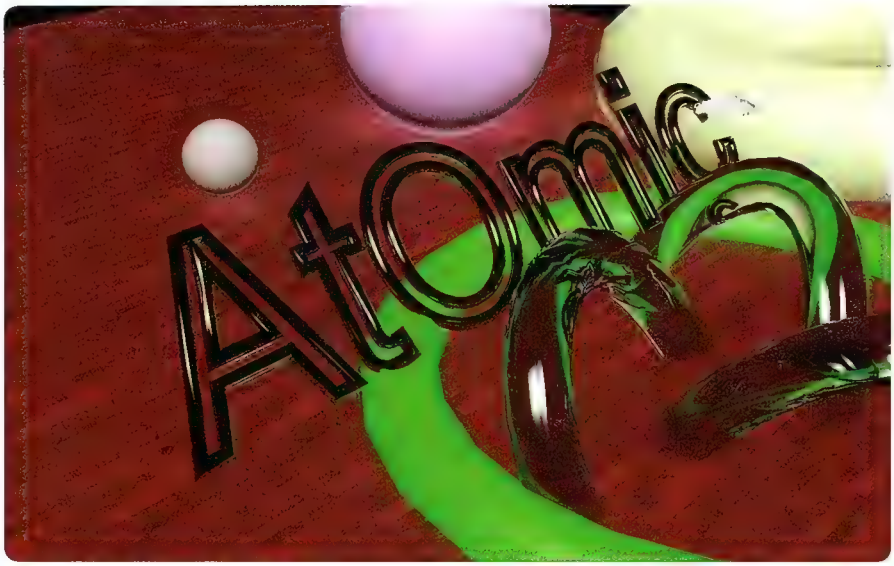
It was only a matter of time before we'd cross paths with ray tracing. This month, we're going to cast some photons on the unintuitive but fascinating world of simulated light. This concept has incredible depth; we could fill the magazine cover to cover just explaining the mathematics. Better put on some sunglasses – it's about to get bright in here.

Trendsetters

Trends and fashion in the electronic gaming industry aren't that different to the catwalk in Paris or Milan. Concepts and ideas all seem to have a cyclic ebb and flow. When an innovative developer brings something to market, shortly after, other developers will do the same thing. Behind the scenes in graphics engine land, it's no different. ACM was a big buzz-term in the early 1990's (Advanced Computer Modelling). Companies such as the once mighty Rare used ACM to produce stunning realism (for the day) in games such as Donkey Kong Country and Killer Instinct. Motion capture technology was also the talk of the town, designed to help animators and CGI modellers more accurately represent human movement. MIP mapping, bump mapping and mesh manipulation came into being.

Certain CGI (computer generated imagery) techniques, core to some very advanced physics and mathematics, have been with us for a very long time, but only recently have we been able to exploit some of these techniques in the consumer entertainment world. It's only now that the processing power required to use such techniques is available and practical.

Readers keen on GPU news may have noticed recently that several key players in the graphics engine industry are speaking their minds with regards to where we are heading. Significant heavyweights such as John Carmack (id Software) and the likes of start up groups such as Euclideon are suggesting two different paths for our graphics engine future. Currently, it's hard to pick between the two paths in determining which is more viable. So let's boil it down to features.



The first Atomic ray tracer demo, using 3DSMax 2012 x64. This scene took 7 minutes 2 seconds to render a 1920x1200 image on a Core i7 series CPU, calculating light paths for each interacting object in the scene.

Ray tracing 101

The concept of real-time ray tracing has existed since 1986. The technology came into being for theoretical applications, first cited and presented at USENIX. It was the invention of Mike Muuss (October 16th, 1958 – November 20th, 2000) as a theoretical means to calculate rendered reflections in CAD software. This doesn't help us understand what ray tracing actually is however. Mike's brilliance lives on long after his death. He also wrote the venerable network 'ping', which we all use most days of our lives.

Stay with us here, as this becomes a little abstract. Ray tracing is a technique for generating images, either static or in motion, by tracing the path of light (or photons) through pixels in an image plane, and then simulating the subsequent effects of the photons as they encounter objects on their path. Think of it as an image telling the story of thousands of photons as they hurtle through space and bump off things on the way.

Ray tracing is known for its ability to create images with unparalleled realism – much higher than traditional scan-line rendering. Unfortunately, it oftentimes comes with immense computational costs. The realism we see in ray-traced images is not a matter of luck or chance. It is a physical reality. The realism stems from the fact that physically 'correct' images are composed of light interacting with objects, and that light will usually come from a light source. This light bounces around as light rays in a scene before hitting our eyes or the camera. Because we can reproduce (with mathematics) the path followed from a light source to our eye, we're able to determine accurately what our eyes would see, had the scene been viewed in real life.

Think of it as an image telling the story of thousands of photons as they hurtle through space and bump off things on the way...

How does it work?

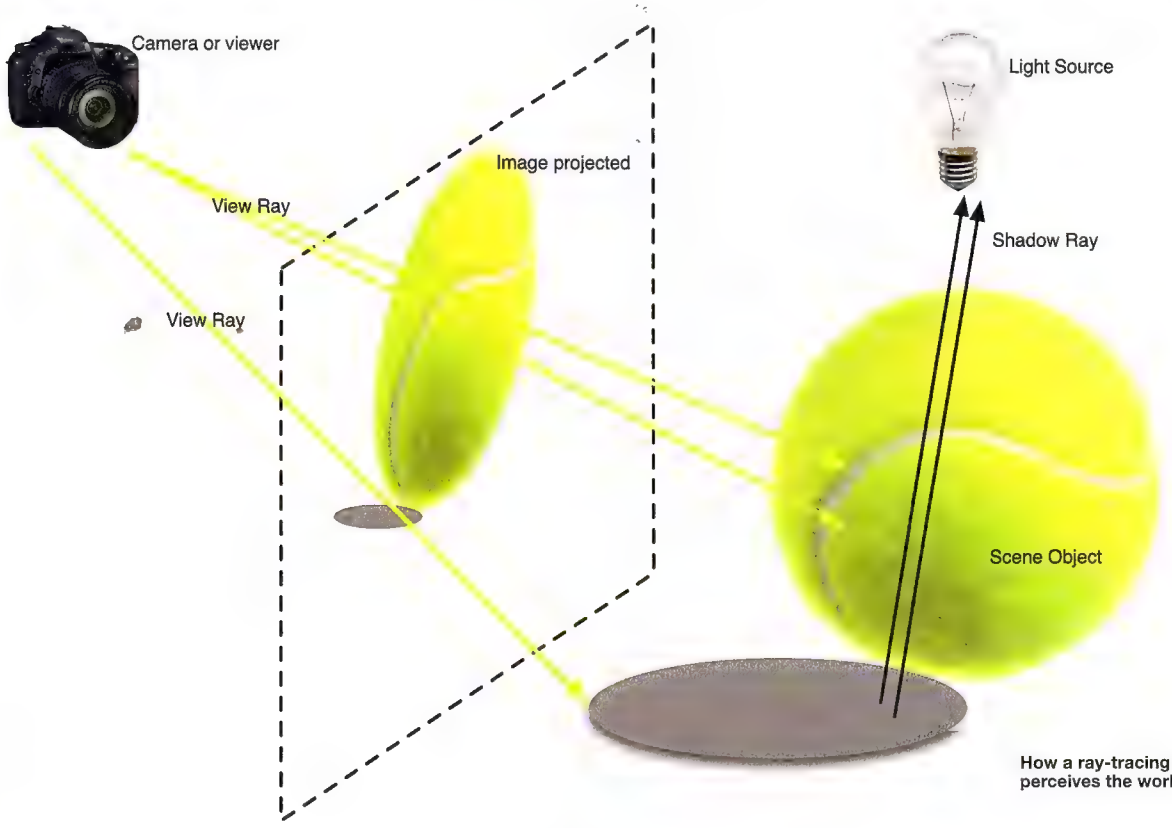
The most straightforward way to explain ray-tracer algorithms is that they build an image by projecting or extending 'rays' into a scene.

Scenes in a ray-traced environment are described mathematically, and as such, can be manipulated with very fine granularity; either in a GUI or via pure numerical input from a software engineer. Where the computation becomes complex is when each ray that is cast is tested for 'intersection', or a crossing with some other subset or other object in the scene. Think of standing in a hallway and looking inwards to see a ball sitting on the floor of the hallway. Each side of the hall is covered in glass mirrors. The ball reflects everywhere. Each time it reflects, a new calculation is required for the ray that is cast in the opposite direction. Each time *that* ray is cast in the opposite direction, another calculation is required as it bounces off the next surface. This is demonstrated in Figure 1, where we see the Atomic logo interacting multiple times with other ray traced surfaces, creating a scenario of reflective recursion.

It seems backwards to send rays away from the viewer (known as the camera or view portal) instead of towards or into it (as light would in the real world), but it's computationally many orders of magnitude more efficient. The vast majority of light that we see bouncing into our eyes from a light source doesn't actually make it to our field of vision. The intuitive simulation would use a great deal more processing power to calculate all the light paths we'd never actually see. This more complex forward simulation is known as photon mapping. Given what we've described here in terms of the computational workload, it's unsurprising that ray-tracing techniques don't translate well to real time rendering in game engines (currently).

Give me shiny

There is a tipping point we're approaching, however. We're now at the point where a Fermi (NVIDIA) or Winterpark (AMD ATI) GPU can with the use of significant CUDA or OpenCL



How a ray-tracing engine perceives the world.

constructs render real time ray tracing at 720p near 60 frames per second. That's great, but it's in isolation, with static models and it's not scalable. These GPU's will work very hard to attain such frame rates with such intensive tasks, so it's almost impossible to expect a GPU to fully render user-controlled environments as well as contend with the task of real time ray tracing.

It's (now) a semi-realistic prospect that a gamer can have eight threads of execution in their consumer grade desktop CPU, for around $500. The NVIDIA Quadro FX 5000 series GPU, like the one we are experimenting with here, is a $3500+ GPU designed for only the most serious industrial tasks. Six minutes difference in render time, but is it worth $3000 more?

Nobody in the industry will deny that a single very powerful GPU can calculate more ray casting effects in real time than a 12-thread x86-64 system, but it can't do much else at all while it's doing this. Developers from companies such as id Software realised this, and as such, their offline processing and rendering environments ceased to use complex CUDA/Tesla clusters for scan line render parallelisation and they now use bulk commodity x86 boxes en-mass with ray tracing engines for the same tasks. The results are better in terms of platform stability; things get done quicker, because higher core counts can be achieved at scale for comparatively less money and ultimately, whilst the performance-per-watt is unfortunately lower, they are more productive. They realised a tipping point: that GPUs are extremely capable, but are no longer the solitary performance driver. This may be the way forward in advancing hyper-realism in our graphics engines. Games developers desperately want to be able to realise a fully real-time ray traced world.

The second Atomic ray tracer demo, using 3DSMax 2012 x64. This time, the scene took 1 minute 8 seconds to render a 1920x1200 image on a Core i7 series CPU, coupled with the iRay GPU CUDA renderer using the NVIDIA Quadro FX 5000 GPU. CPU usage was minimal, because work was via GPU.

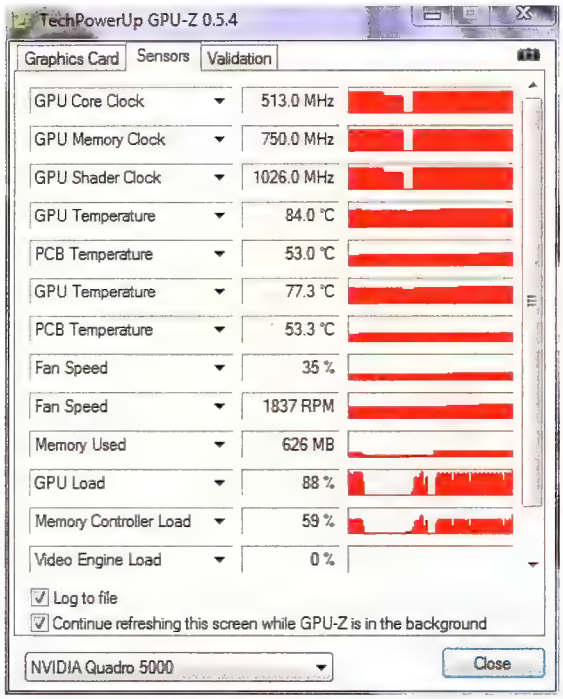
Why it looks so good

We've discussed briefly why ray tracing looks realistic. There is a subtlety to all of this that can't be explained simply by the fact that realism comes from light bouncing around with accuracy.

Everything we perceive visually is a construct of the light that is emitted from objects, and the ability of an object to reflect light. There are several effects that we can visually 'understand' that make real life look the way it does, and make ray traced scenes look very close to real.

In real life

In the real world, a ray of light has lots of things happening to it on the path away from an object towards our eyes. Any combination of reflection, absorption, fluorescence and refraction might take place. Surfaces in nature aren't perfect and can absorb part of a light ray hitting them, so that the light we see coming back from the object is less intense. Depending upon the surface, it might also reflect some light, or be very shiny, so we might almost see a "mirror" effect. There is also the possibility that light will bounce or pass through an object if it has any translucency or transparency. Because of the physical properties of a material, light might bend or warp slightly inside it, and bounce out at a different angle. This is why when we look at a glass with light shining through it, if the glass is thick enough; we see curvature of the light passing through. Fluorescence is also possible, where the light absorbed by an object is somehow emitted at a different wavelength and thus has the potential to 'glow' in a seemingly unnatural state. Many examples of this exist in nature and science, with several minerals and animals being capable of such phenomena.



The Quadro FX 5000 CUDA GPU utilisation when rendering the Atomic ray tracer demo.

In the machine

Because we are (sort of) clever, we've been able to simulate all of the above natural occurrences to some degree of accuracy with mathematics. As a result, we can create photo-realistic renditions of these occurrences with CPU and GPU power. Using these base concepts, we can create effects such as depth-of-field (DOF), scattering, dispersion and unusual interference patterns such as chromatic aberration.

Practical applications in gaming

To ray trace realistically, 1080p resolutions at or above 30fps with anything else taking place on a screen in real time isn't possible on current generation GPUs. Hard as it is to contemplate, your AMD ATI HD6990 just isn't up to the task. With authority, we can tell you that neither the upcoming AMD ATI Southern Islands silicon, nor the NVIDIA Kepler GPUs will be capable of it.

Companies such as id Software have suggested that no current or upcoming generation hardware is capable of delivering their vision for their id Tech6 engine (the leap beyond what we're all about to see in RAGE, being id Tech5), because the shift and momentum of next generation graphics engines will hybridise traditional scan line rendering techniques with fully integrated real time ray tracing.

Several companies between 2005 and 2010 came up with novel approaches to real time ray tracing that could be adopted en-mass for the gaming market. These included the CausticOne hardware ray tracer card, coupled with

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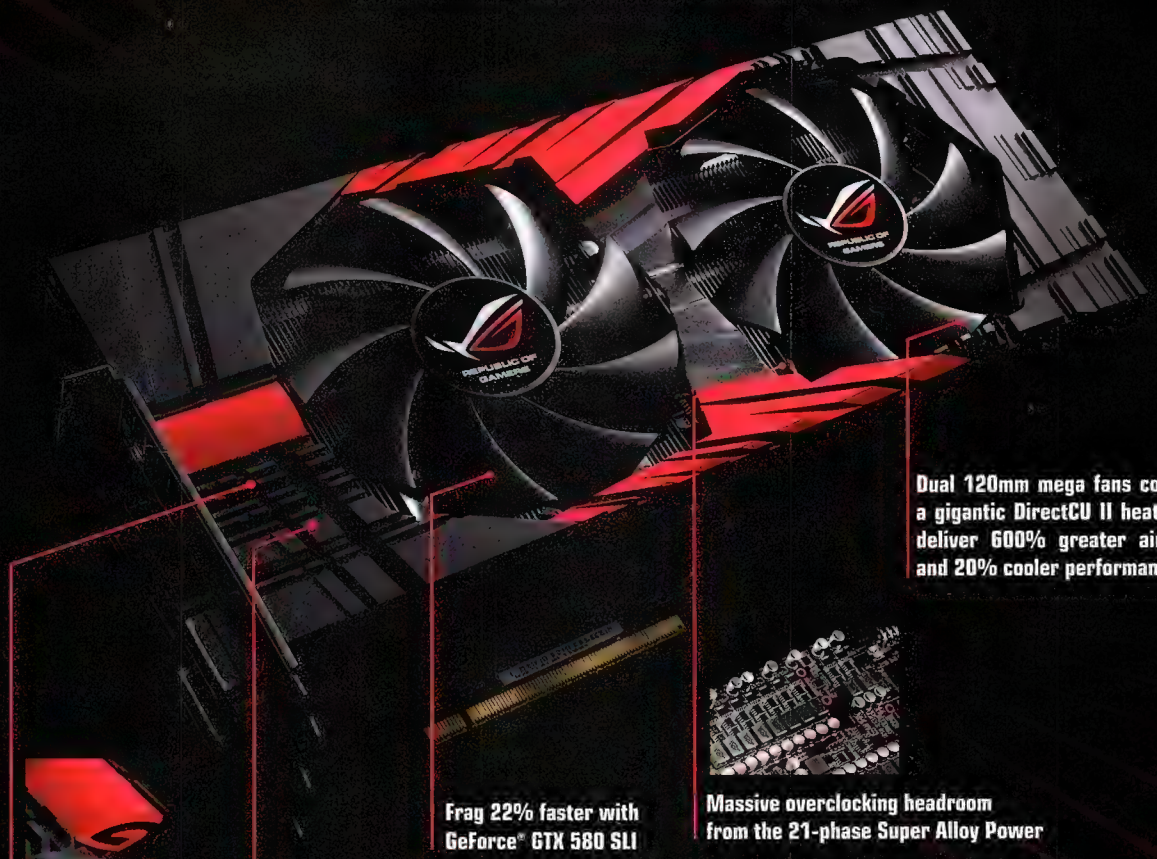

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Ray-traced CGI scene demonstrating multiple natural optical effects.

This is why when we look at a glass with light shining through it, if the glass is thick enough; we see curvature of the light passing through...

CausticGL, the now unfortunately quiet OpenRT project (a partially open source ray tracer development platform and library specification), and NVIDIA's Tesla/FERMI combination with exposed dedicated ray tracing API's for developer use using OptiX.

It all comes unstuck, however, when we get back to economics and the real world. Normal people cannot afford Quadro and Tesla systems, let alone cramming multi-socket ultra high-end motherboards into their desktop gaming rigs. The average enthusiast probably won't spend a great deal beyond $3000 on their new system. The prospect of a $15000 entry point for a dual socket 40-thread Xeon system based on Intel's E7 series Westmere is impossible to fathom.

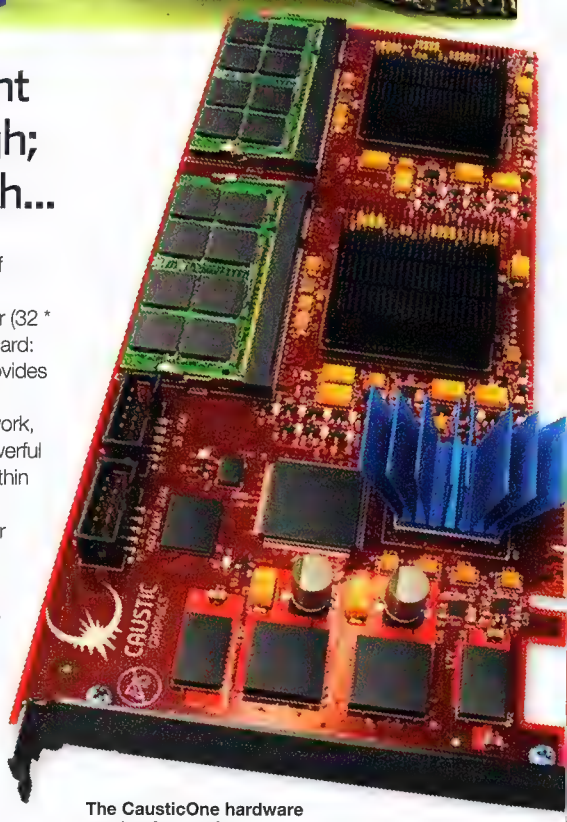
The cloud is back – again

Realising what can be achieved, Intel have put some of their researchers to work, chiefly graphics research scientist Daniel Pohl, to think of ways to tip the economics problem on its head. They came up with the idea of cloud-rendering.

Intel's MIC platform, aka Knight's Corner (32 * x86 CPUs on one chip, living on a PCI-E card: **www.atomicmpc.com.au/?261259**) provides 'cloud ray tracing' such that the average consumer PC doesn't need to do all the work, rather, the complex work is done on a powerful system somewhere else, and they have a thin client stream back to the desktop.

The technology was shown late last year with the tech demo of Wolfenstein: Ray Traced, showing fluid, 60fps full screen ray tracing combined with rasterised graphics.

People like Carmack and Pohl have a clearly distinct, but similar vision of where they want the industry to head and how they'll achieve true photorealism in gaming. There is a moral here. Something about dreaming big and waiting for technology to catch up, we think.



The CausticOne hardware ray-tracing engine.

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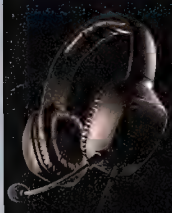

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INPUTOUTPUT

Dan Rutter brings the answers to your questions like no-one else can.

I/O OF THE MONTH

Education versus Facebook

My wife is a university lecturer. The other day, she was lamenting the students who show up for a lecture then just sit there texting or Facebooking or playing *Angry Birds* or whatever. The students with laptops can at least pretend to be taking notes, but the ones with phones might as well be giving her the finger through the whole session.

They don't really do any *harm*, so she hasn't tried high-school solutions like confiscating phones. But the other day I noticed that about half the population of Hong Kong seem to be in the business of selling mobile phone and/or WiFi jammers. I'm considering getting her one for her birthday. If they're legal.

Are they?

T. Hollick

Nope.

Mobile-phone jammers - which is to say, any kind of radio jammer that operates on the GSM frequency bands - are prohibited in Australia. The relevant government body is the Australian Communications and Media Authority, who hold forth on the subject here: **http://bit.ly/phonejammers**

GPS jammers are also illegal.

There's a moderately good reason for this – there are situations in which jamming phones or navigation systems could be dangerous, because they prevent people calling for help or finding their way home. There's also a flaky security-theatre reason – phone and GPS jammers could aid in the commission of a number of exciting crimes that will probably never happen outside of Matt Damon movies.

Wi-Fi jammers, interestingly, aren't illegal here, as long as 802.11/whatever is all that they jam. There's been discussion of adding Wi-Fi jammers to the prohibited list, but they're not on it yet.

As you say, though, eBay and DealExtreme and numerous other sources stand ready to sell you little black boxes that jam everything from ELF submarine orders to Dick Tracy's wristwatch. Your contraband jammer might make it through Customs, too. But even if you took the risk of getting busted, the jammer still wouldn't stop people playing single-player games they've already got on their phone or laptop.

(You'd probably get away with taking a jammer with you to the movies, though. I'm just saying.)

It is not, to the best of my knowledge, illegal to line an entire lecture hall with earthed conductive material and thus turn it into a Faraday cage, through which little to no radio waves can pass. When you're in a building and your mobile phone reception is very greatly worse than it is outside, it's probably because the structure of the building - a steel frame, for instance - is a bit Faraday-cage-ish.

Since the Australian university system no longer includes tenure, though, I cannot in good conscience recommend your wife become known as the wide-eyed lecturer stapling chicken wire all over the walls of Lecture Hall 5.

While you're breaking the law, you might as well pick up a radar detector too.

Forget RGB; just G is enough

Can you plug an old green-screen monitor into a modern computer?

I'm shooting a short film set in 1984, and I want some plausible-looking computers, but without having to get a whole Apple II working for every screen. There needs to be some stuff actually happening on the screens, so I can't just do it like Star Trek and use backlit still transparencies.

Harry Davis

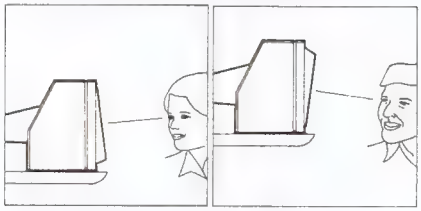
Yes, you can.

Driving old digital-input monitors (like CGA and EGA screens, for instance) from modern hardware is a big hassle, but good old green and amber monochrome monitors like Apple's millions-sold "Monitor II" (conveniently released in 1984!) often have a simple little composite-video input. That lets you connect them with an RCA cable to anything with composite output. The TV-out of an ordinary video card, a DVD player, video camera or VCR; you name it.

(Yes, this does mean that if you're perverse, you can set up a Monitor II as the second display on a modern computer.)

As long as you're not trying to plug an Australian PAL source into a monitor that wants American NTSC, your biggest challenge will be finding Monitor IIs, or similar screens, that still work. Note that you absolutely must get a screen with composite input to do this, though; if it

Line of vision and perpendicularity of Screen



The Monitor II's range of screen adjustments are unsurpassed even today.

doesn't have an RCA socket labelled "video", you don't want it.

Vintage green and amber monitors are a rather trippy way to look at any sort of modern motion graphics, because apart from their obvious monochrome-icity, they also have very high-persistence phosphor, which keeps on glowing for a long time after the electron beam scans over it. This made these old screens less flickery than their miserable refresh rates would suggest, but it also means that anything moving quickly will leave a trail.

That may be a desirable feature for movie-making, though, because it reduces the distracting flicker you see when CRT refresh rates don't match the frame-rate of the camera.

Loud, loud, loud, inaudible.

I Why are volume sliders garbage? The ones in Winamp and Foobar2000 seem to work like they should, but lots of other ones seem to make very little difference to the volume for most of the slider travel. If you want 90% volume you should set the slider to the 50% mark; if you want 50% volume you need to go to about the 15% mark.

Isn't this, like, the simplest and most obvious thing in the universe? How do so many programs (or programmers) manage to screw it up?

Mary Lance

O Linear versus logarithmic, that's how.

The human ear perceives volume in a logarithmic fashion. For something to sound twice as loud, it needs to actually have something like ten times as much sound energy. And, similarly, for something to sound half as loud it needs to have about a tenth of the energy.

(For this reason, it's not actually very important that your audio amplifier have a monstrous power rating. Most music and home-theatre listening only uses a few watts per channel.)

The obvious way to implement a software volume control is by just mapping the slider or knob position directly to the signal attenuation setting. 50% on the slider, half as much power. Which gives the result by which you, and countless other people, have been annoyed.

This can even happen in the hardware world, when someone uses a linear potentiometer instead of a logarithmic one as a volume control.

Foobar2000 avoids this problem with so much enthusiasm it's slightly confusing. It gives you a recording studio-style volume attenuator calibrated in decibels, from zero at maximum volume to -100dB at minimum.

Life forms, spatial anomalies not yet scanned for

I I've been using Mozilla Firefox for a number of years now and I only recently paid any attention to that "Scanning for viruses..." message (along with a loading bar) that pops up underneath the entry in my Downloads window. It occurs after the item finished downloading and only lasts a number of seconds.

I'm curious, is it actually doing anything important, and what virus database does it use? I have AVG Free Edition, so would it use that? For a 3 second scan it couldn't possibly initialize an AVG Shell Extension scan, could it?

Tristan Clemente

O Yes, actually Firefox *is* using the antivirus software you have installed. The browser doesn't have an antivirus database of its own. If you have no antivirus software installed, you shouldn't see the "scanning for viruses" notification.

If your antivirus software is already monitoring what you download and/or run (you've got "real-time protection", or whatever your antivirus calls it, turned on), then the Firefox feature won't make much difference. If it annoys you (which it may, if for instance it takes an unreasonable amount of time to scan large files), you can disable the feature by typing about:config in the Firefox address bar, typing "scanwhen" to winnow the zillions of entries, then double-clicking "Browser.download.manager.scanWhenDone" to change it from "true" to "false".

"You have insulted my honour, and for that your frame-rate must die!"

I In Fallout 3, and New Vegas, and I think maybe even Oblivion but I'm not sure, there are certain things that make my frame-rate go completely to hell when they're in the field of view (or would be, if there wasn't a wall in the way).

In the Fallouts it's any "distortion/refraction" effect, like some explosions and the jets under Mister Handies and Gutsies. (Oh, how I hate Mister Handies.)

There are about a thousand ways to reduce "stutter" in the Oblivion-engine Fallout games, and I've tried them all, including turning off every possible water effect and using the "Stutter Remover" mods. Still, if someone shoots a missile at me or I throw a plasma grenade or one of those goddammed floating robots comes over the horizon, I'm back in Jerkyland.

I'd be happy just to be able to turn off these effects, but after grinding through the console commands and INI files, I can't find a way to do it. I've only got a 512Mb GeForce 8500 GT plugged into my nice 1920 by 1200 24-inch Samsung LCD, but this is a 2006 game engine. Do I really need to buy a new graphics card?

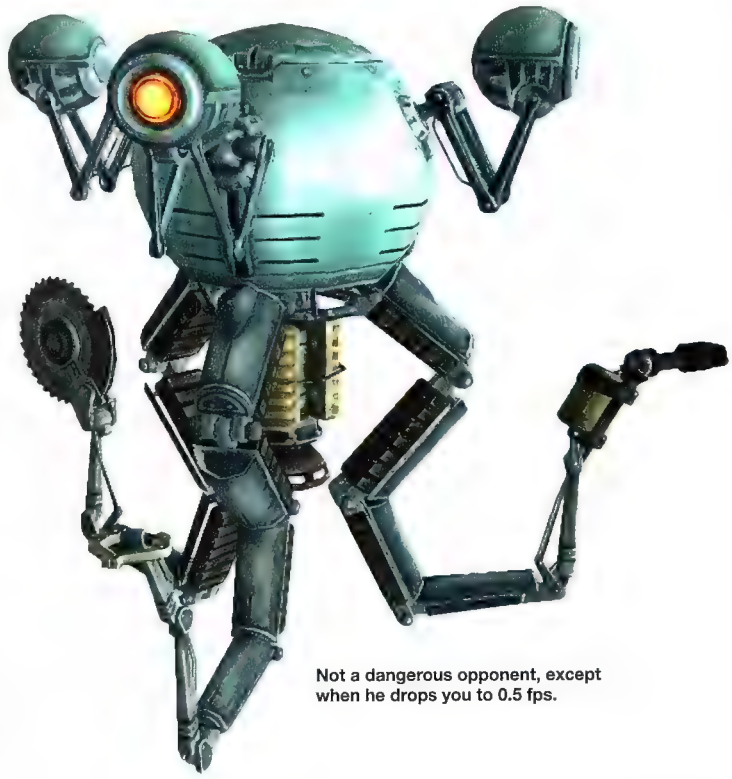
Richard Campbell

O A video card upgrade actually probably would help, but only because, and you're going to kick yourself for this, your problem is that you're running out of graphics memory.

The hot-air/shockwave/Oblivion-gate effect suddenly requires some more video RAM, when your relatively low amount of graphics-card memory and relatively high resolution have already put you right up on the limit.

So you run out of RAM, and stuff gets dropped on the floor and then replaced from system memory, and play ceases until this process is complete. The solution is to reduce your video RAM usage, most simply by reducing the resolution or turning down anti-aliasing.

This problem is as old as add-on 3D cards, but this is a sneaky version of it. Usually, inadequate video RAM means a dreadful frame rate all of the time, not just occasionally.



Not a dangerous opponent, except when he drops you to 0.5 fps.

The power of junk

Need tips on thrift? **Ashton Mills** has never thrown anything away. Ever.

Ah, vindication!

You may remember the Man Cave and she-who-loves-to-organise, and how between the cave itself and a subsequent moving of house she has lamented more than once on all my 'junk' lying around. And, more specifically, her perennial question: do I really need it all?

Well, really, no. Most of the time. Perhaps. Granted some of the stuff (ok, the majority of it) will never see use again, and some of it is there only for the sentimental – but I keep it 'just in case'. You know, should I feel the need to go all Frankenstein on my main PC, or get around to finally rebuilding my Uber Box, or cobble together an HTPC or just... I don't know. And that's point. To quote the movie Contact when Ellie is offered the cyanide tablet, "This is for all the reasons we can think of that you might need it... but mostly, it's for all the reasons we *can't* think of".

So. Her PC died recently, and it turned out to be the PSU and, as it happens, in my stash of stuff I happen to have a spare, older, power supply. Two of them, no less – an Antec Neo HE 550 and Seasonic 500, both enough juice for the Athlon 64 FX-60 and NForce 4 SLI based system she has. But, while I was at it, I figured I'd replace her rather aged 8800GTS with a GTX 280 from my old box. It's admittedly a gas guzzler, but nothing either PSU couldn't handle.

Or so I thought. Now keep in mind both of these PSUs have 6-pin PCI-E connectors for GPUs, but no 8-pin, and the GTX 280 needs one of both. I happen to have a collection of 8-pin adapters that pull juice from a molex plug 12V pin, sourced from video cards over the years, so this wasn't a problem. I hooked the Antec up first and switched the box on.

It hummed and purred, and then shut down. Curious. A number of combinations of the PCI-E power connectors and the molex plugs, just in case its separate rails were playing a part, and the best it would manage was maybe ten seconds before powering off. Ok, not to worry, I do have *two* spare supplies after all. So onto the Seasonic. I hooked everything up, turned the PC on and she happily displayed the BIOS and we were off.

For about two minutes. Then the Seasonic, too, powered off. This was repeatable – seemed quite happy, but only for a few minutes.

Keeping in mind the dual-core Athlon 64 2G RAM system isn't particularly taxing, and the GTX 280 was idle, it seemed strange to be cutting out so early.

Dang, would I have to actually buy a new PSU for this old system? Did my collection of stuff fail me?

But wait, I seem to remember having a *third* spare PSU somewhere in the depths of my memory – a rare 'silent' model from Antec, the Phantom. I don't even remember where I got it from, but where was it?

So I delved deep into my archives of stuff, mounds and mountains of electronic gear whizzing past me as I twisted and twirled in a torment of discovery (note: sentence may contain traces of slight exaggeration) and lo – I found it. The Phantom, a 500W PSU with a heatsink for a shell. It appeared older than the other two PSUs, especially as it had only one 6-pin PCI-E connector unlike the Seasonic's two.

Hours later, even under load testing, the ungainly old PSU kept the system stable...

But hooking it up and firing up the PC magic greeted my eyes – it booted up, and stayed up. Hours later, even under load testing, the ungainly old PSU kept the system stable.

My stuff, my aging collection of gear my partner would look at in dismay and ask 'Do you *really* need all this?' had saved the day. Sweet victory, tangy vindication. I stood justified, happy, chuffed, and she who thinks the junk in my cave is crap smiled too, for her PC was back in action.

And thus, padawans, I say – drawing on my aged pipe, smoke billowing through my bloated beard, hunched in the dancing light of the camp fire telling my tale – this is why junk is always useful to have. Sometime, eventually, it will come to serve you well.

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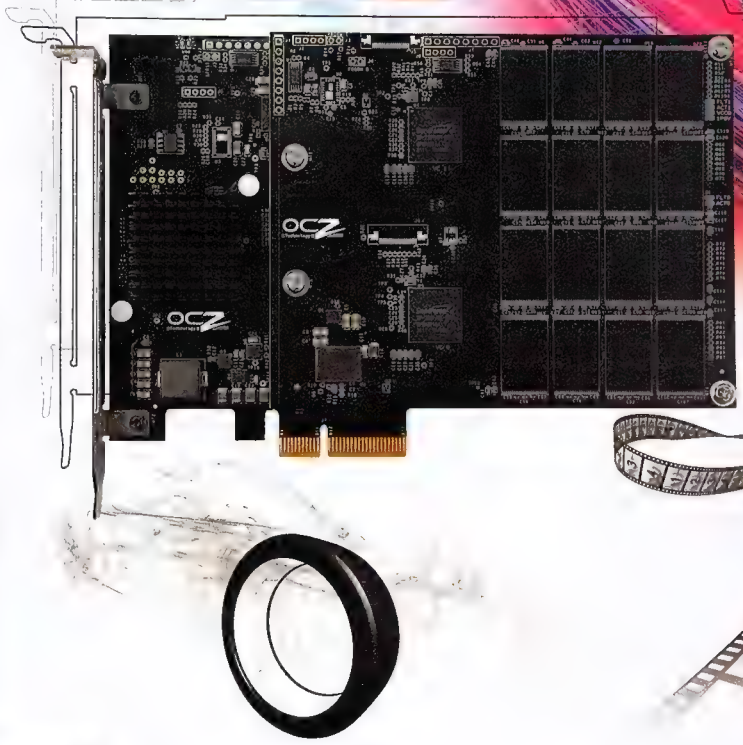

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CONSOLE WARS & COLLECTORS: The 16-bit era

The Super Nintendo Entertainment System and Sega's Mega Drive engaged in a fascinating fight for the market, evolving games and gaming culture. **Ben Mansill** and **James Matson** examine the scene, then and now.


SUPER NINTENDO
ENTERTAINMENT SYSTEM


SEGA

War? You want war? Prior to the 16-bit era of the 1990s, the NES vs Master System battle was a mere stoush. A gentle trading of soft blows in mostly friendly banter. It was a period to gently rib, rather than launch a furious fanbomb. It proved to be a valuable warm-up, because, when the Sega Mega Drive and Super Nintendo Entertainment System squared off on the battlefield it was truly on for young and old. Mostly young.

Of course, there was no internet back then. Had there been, there's absolutely no doubt we'd have seen an ugliness and parochial havoc-wreaking that knew no bounds. We were working at Hyper at the time, and fair dinks – 2 out of every 3 letters were "My stupid mate reckons [console] is better than [console], please print my letter and tell him he's an idiot."

16, and other numbers

So, which was better? After a decade and a half of pondering the issue, and now with the benefit of the internet where the battle still rages on, we can safely say that they each had their advantages: *and it really doesn't ultimately matter*. In the end, the raw sales figures point to a marginal win by Nintendo. The SNES sold 49 million units worldwide, against the Mega Drive's ('Genesis' if you were American) 40 million. But add another 6 million to Sega for the Mega CD and a spot over half a million for the 32X, and it's as close to 'head-to-head' as one can reasonably conclude.

Far more interesting is how each company played out the battle.

Targeted salvos

After copping a battering at the hands of the NES, Sega was by far the more aggressive company in the 16-bit wars. Nintendo didn't even want to do a replacement for the NES. With 60-odd million NES consoles in homes the company was focussed on that sweet cash cow, and the revenue from Nintendo's own first-party games was immense. When it did finally decide to do a new machine, Sega had a huge head start and it took Nintendo 2 years to finally launch a console to stack up against the Mega Drive.

In stark contrast, Sega came out swinging.

Sega was by far the more aggressive company in the 16-bit wars. Nintendo didn't even want to do a replacement for the NES.

The company had identified the 'gamer' market and the Mega Drive was aimed squarely at the cool kids. Nintendo was all about the family, and the differences in everything from design and marketing were dramatic.

A tale of two cultures

When the SNES launched in 1990 it even looked retro – 2 years behind Sega and its sexy black device notwithstanding. The SNES had an offend no-one design and came only in uncool dull-grey. Its control pads were dinky little grey slabs with bright kidsy buttons. Whereas the Mega Drive looked like something Marty McFly had brought back from the future. It was a simply gorgeous piece of design; sleek, black, like a little spaceship. The Mega Drive's control pad looked like a Batarang, and without prejudice we say it was much nicer in the hand. Indeed, when Sega later released its 6-button control pad to better support Mortal Kombat (fighting games being all the rage), it was what many regard as the finest control pad ever designed.

It helped too, that the Mega Drive was backwards-compatible with the vast library of Master System games. Sega was looking strong, though Nintendo is never one to be underestimated.

Let there be blood

If ever there was a single moment that separated the two, it was when Nintendo chose to censor Mortal Kombat for the SNES. The bloodless version for SNES was roundhoused by the full-gore version for Mega Drive. This was an overt statement of differentiation by Nintendo. SNES was for safe, clean family fun; Mega Drive was for the hardcore.

This wasn't missed by American conservatives. Video gaming had largely been left alone until Mortal Kombat came along, then the outrage got serious. For a while it simmered, but when Night Trap was released in 1991, showing FMV scenes of Diff'rent Strokes sweet girl Dana Plato being savaged by monsters, it was too much for the politicians and a congressional investigation

Collecting

Super Nintendo Entertainment System

Why collect it?

The SNES achieves the perfect balance between something old enough to be funky and retro, but still modern enough to command just about any gamer's attention with its great graphics and popular library of games. The SNES carried strong franchises like Mario and Zelda from the NES while adding games from fantastic third parties such as Tecmo, Konami and of course, Capcom. Have you ever played Street Fighter 2 on the SNES? It's more than just a near-perfect arcade to console port, it is pure gaming bliss. Seriously, if you haven't tried it yet then drop this magazine right now, go hunt down a SNES and a copy of one of the Street Fighter incarnations (Turbo, Championship etc) and have yourself a cracking good time. The SNES also happens to be one of the most durable pieces of hardware around, so despite the fact these units have been bashed at for years you're unlikely to run into any issues owning and playing one.

Where to get it?

Because the SNES has the distinct pleasure of being one of the few consoles that is as much coveted by gamers as it is by collectors, its popularity doesn't mean it's easy to find. People may throw most of their house out the front for a garage sale, but it's safe money the SNES is still tucked safely inside someone's lounge room or bedroom. You could give the local op-shops and markets a try, but the likelihood is someone who got up a little bit earlier or searched a little bit harder than you, has already scooped them up. For maximum results you'd best just drawing on your internet powers. Super Nintendo consoles still show as in stock at a variety of Gametraders stores, and a few keyword searches on both Gumtree.com.au and eBay reveal a variety of consoles – with or without games – on offer. Strangely, there's a real lack of boxed machines around; we found it far easier to source an original Nintendo Entertainment System boxed, than a SNES. Kids back in the day must have been so excited to get one that they simply tore the packaging apart with their teeth to get to the sweet Nintendo goodness inside, leaving fewer boxed examples for the collector to find. Games follow the same trends, you're unlikely to find them at garage sales or op-shops, but there are plenty of titles still in circulation online and many of those are still boxed with instructions.

What will it cost?

There's not a lot of good news to be had here. The simple fact is that people want the SNES as a collectors piece because it represents a massive chunk of the 16-bit era, but also as a versatile and fun gaming machine to actively play on. The standard console with all cords and a couple of controllers will likely set you back $60 or more unless you find a generous seller or a total bargain. If you're looking for something boxed, then the price takes a few more vertical steps and you're up for just shy of $100 if the box is in decent condition. Games too can have some hefty asking prices. Your basic run-of-the-mill Golf game or eleventy billionth copy of Nigel Mansell's Championship racing you might grab for $5-8, but anything more desirable than that and the price skyrockets. If we had to pick an overall average then it's around $15-25 per cart, and $25-40 for the same game boxed.

As you can see, building up a large library of SNES titles could be an expensive endeavour, especially when you start looking at fan favourites like Zelda or one of the many popular RPG titles which can set you back $100+ depending on the title rarity, popularity or condition. Super Famicom – the Japanese version of the SNES – can easily fetch even higher prices for the base unit and games.

Caring for it

In the wild the SNES would be a titanium-plated rhinoceros/camel hybrid; it doesn't seem to require much maintenance or be prone to hardware issues and can run for many years without fault. They tend to work just as well now as they did on release. There are, however, a few fantastic mods you can look into to extend the versatility of your Super Nintendo console. There's information out there on changing the SNES led colour, completely disabling the SNES lockout chip (allowing you to play PAL games on NTSC machines and vice versa) or adding your own 50Hz/60Hz flip switch for your games as found here: **http://tinyurl.com/6bds834**.

into gaming was launched.

Sega knew what it was doing, and played to the controversy as a fighter for gaming and creative freedoms. In the fallout it benefitted enormously. The company had balls and attitude; Mega Drive was the must-have platform for bad boys and girls. And it had a mascot that exemplified that outlook.

Mascot smash

Sega didn't have a noteworthy mascot during the Master System era, ceding early ground to Nintendo's Mario. When Sega did jump in it gave the world Sonic the Hedgehog. The little 'hog was able to run rings around plonky Mario and he reinforced the cultural chasm between the two audiences.

The little 'hog was able to run rings around plonky Mario and he reinforced the cultural chasm...

Sonic brought more than a sneer to the gaming scene. The first game – Sonic the Hedgehog in 1991 – showcased a dazzling new style of high-speed gaming. Technically, Sonic was a landmark. From the first level to the last, it was nothing but an insane high-speed dash, looping and jumping with jaw-dropping smoothness. Multiple parallax scrolling backgrounds created a sense of depth, too, and the gameplay was both mesmerising and infinitely replayable.

Strutting its bravado at the time, Sega's marketing claimed such Sonic speed was due to the Mega Drive's "Blast Processing" capabilities. Pure nonsense, it nonetheless helped colour the Mega Drive as a machine of immense power.

Magic Mode 7

Nintendo fanbois at the time were able to counter with a technical claim of actual legitimacy. The SNES was able to do a rudimentary form of 3D, which the basic Mega Drive couldn't match. 'Mode 7' was a SNES function that could scale and rotate a 2D plane. Programmers could take 2D background and display it horizontally, stretching into the horizon to create depth and perspective. It was a mighty impressive technical feat for the time, and was capitalised upon by developers, allowing for games like Super Mario Kart, Final Fantasy IV and Star Fox.

Mode 7 had its limitations, the key one being that sprites still needed to be 2D. Super Mario Kart is a classic example; the vehicles display in a stutter shift between behind and basic left and right views. Still, it was a big gun Nintendo and its fans needed to counter the Mega Drive.

3D, or not 2D

The 16-bit consoles were engineered for 2D gaming. Besides better colour and sound, parallax scrolling was supposed to be the big jump from 8-bit. Mode 7 wasn't planned to be a key feature of the SNES, it was just seized upon by crafty developers. As it turned out though, 3D was shoehorned in through the later years of that generation, before the transition to 3D powerhouse 32-bit consoles.

Sega stepped up to 3D far more aggressively than Nintendo, and did so by supplementing the Mega Dive as a 'base platform' with a variety of engineering solutions. The Mega-CD – which

Collecting Sega Megadrive

The Megadrive: not universally beautiful – Megadrive, 32X and Mega-CD combination

Why collect it?

Owning a Megadrive is like owning a SNES: it's partly about possessing a slice of what many people consider to be the glory days of the console world. 16-bit was a golden age of gaming, and the Megadrive game library reflects that. Sonic, Golden Axe, Streets of Rage and the sprawling epic Phantasy Star RPG series – these are all fantastic reasons to own a Megadrive in their own right. From a collector's perspective, even the game cases of Megadrive titles are extra tasty to accumulate because – unlike the cardboard shells of most cartridge games – all Megadrive titles come in hard plastic covers, meaning they've stood up exceptionally well to the ravages of time and geek handling and still look great lined up on the shelf.

In terms of collector enjoyment, few come close to the Megadrive in terms of sheer volume of model variants, extras and accessories that can be hunted down and collected (some because they're awesome, some because they're infamously terrible). There are two main models of the Megadrive base unit, known simply as 1 and 2. The first one is generally considered the superior of the two thanks to a more attractive design as well as volume controls built into the base unit itself. The Megadrive 2 was released without the volume control and in a smaller 'cheaper' looking casing, but is still a great way to get your Sega game on. Apart from the base unit variations, there are also a wealth of accessories to be had. The Sega Mega-CD add-on, as well as the much maligned 32x, were both dismal commercial failures. However they do make absolutely fantastic collectables if you've got the cash to blow on them.

Where to get it?

Like the SNES, the Megadrive sold well, but the Sega console doesn't appear to be attracting the fervent hoarding or high prices of its Nintendo-branded brethren. Expect to have little trouble finding a Megadrive (and even less finding a Megadrive 2) at markets, garage sales, eBay or anywhere else where cash changes hand for second hand stuff. Games are equally easy to get your hands on, but steel yourself for finding unending copies of Columns and Alex Kidd ad infinitum, with loose carts more common than anything boxed.

When it comes to accessories, it's a wholly different story. The Mega-CD and 32x are both incredibly difficult to find in any form, and when you do find them they're usually in the possession of an incredibly attached nerd who will, if pushed, use the Vulcan neck pinch to prevent you taking them – in extreme cases they'll declare Pon farr on you afterwards, leading to uncomfortable situations. You'll have to spend time scouring eBay and face stiff bidding competition once you find something.

What will it cost?

If you're shelling out any more than $30-40 for a Megadrive 1 or 2 with controllers and cords then you're getting violently shafted. Throw another $20 at that price and you can probably find one boxed and in very, very good condition. Unlike many other retro platforms, the Megadrive doesn't have many games that fall into the uber-rare category of titles that you'll have to pay for with the light of your eternal soul. This is good news for anyone wanting to build up a Megadrive game library, as it there isn't much left inaccessible by virtue of ludicrous prices.

Caring for it

Apart from the occasional need to tackle the cartridge port with a cotton bud and some rubbing alcohol, there's not much that can go wrong with the Megadrive. The first model can suffer from a broken volume control slider because of billions of children that have mashed it up or down over the years, but apart from that, a lack of moving parts makes this 16-bit wonder relatively safe from the ravages of age. In terms of mods, it's worth investing time and energy into giving your Megadrive S-Video capability: the improved visuals are well worth the effort. Head to **http://tinyurl.com/3hnzen7** for instructions on adding S-Video, composite and stereo sound to your black box of awesome.

arrived in Australia in 1993 – added basic 3D processing. Sonic 3D was the killer app here, with its special stage a Mode 7-alike feat of programming achievement.

A more extreme attempt to add significantly better 3D came with Sega including dedicated hardware processing inside the cartridge itself. The Sega Virtua Processor was a 23MHz 16-bit Samsung DSP, it had its own memory and even had a heat sink installed! It brought true polygonal 3D processing to the one and only game ever released that supported it – Sega's own Virtua Racing, which was all the rage at arcades at the time. Unfortunately it added significantly to the cost of producing the cartridge and went nowhere.

As the 16-bit era was coming to an end, both companies were at work on the next generation.

Sega had one last stab at kicking it up a 3D notch with the 32x add-on. The mushroom-shaped device slotted into a Mega Drive and sported dual CPUs that powered the handful of supported games in 3D. Alas, it served only to confuse a market that was primed for the next gen of true 3D consoles, and wasn't helped by reliability issues. By all accounts it was a poorly engineered rush job.

Now with 17% more slow

There's one thing that marks the 16-bit era here in Australia that no technical wizardry or developer finesse could easily overcome. Our TV system was PAL, which meant a 50Hz screen refresh and a resolution of 576 vertical lines. In America – being the market games were made to sell in – their NTSC system ran at a faster 60HZ and with a lower resolution of 480 lines. That meant our games ran 17% slower, often causing visible frame rate drops, and black bars across the top and bottom of the screen. Native PAL versions were rare from any but the largest games developers.

Game over

Both platforms sold similarly well and saw the release of hundreds of games on each. Sega was by far the most interesting company, though. From its marketing to the look of the equipment, it was geared almost exclusively to the emergent hardcore gamer.

Technically, too, Sega innovated. For all its years, Nintendo had nothing sexier than the Super Scope light gun to excite, while Sega had a light gun, plus, for better or worse, genuinely interesting hardware evolutions with the Mega CD and 32x. It *fought* the console war, while one could say that Nintendo just rolled along with it.

CMSTORM
BY COOLER MASTER

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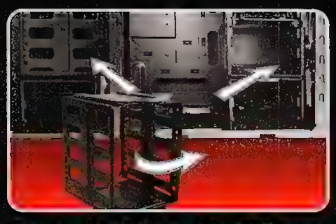

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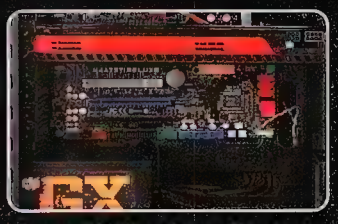

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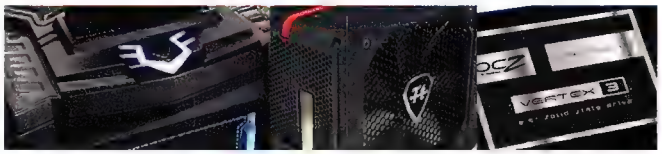

PCDIY 3D Gamer Package

System Case:
- Thermaltake Chaser MK-1 Gaming Case ATX Full Tower

CPU & Cooling:
- Intel Core i7 2600K 3.40GHz - 3.80GHz (8MB Cache)
- Thermaltake Frio OCK CPU Cooler
- Nickel-plated Copper Base with Alluminum Fins
- Dual 130MM Cooling Fan @ 2500RPM

Motherboard:
- MSI Big Bang Marshal B3 Revision with SATA 3 & USB 3.0
- Military Class II components: Top quality & stability
- OC Genie II: Auto OC to boost performance in 1 sec
- ClickBIOS: Easy-to-use UEFI BIOS interface
- Super Charger: fast charge iPad/iPhone/smartphone
- THX TruStudio PRO: deliver the fullest audio experience

Memory:
- 16 GB G.Skill Ripjaws XL 2133 Gaming Memory

Graphics Card & Nvidia 3D Vision Glasses:
- Gigabyte GTX590 Bundle Edition with FREE Gaming Mouse
- Nvidia 3D Vision Geforce Glasses (Wired)

Power Supply:
- Thermaltake Toughpower 1350W Power Supply (80 Plus Certified
- Provides maximum stability & expandability for your system.

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HARDWARE

NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

The tech section is stuffed full this month, starting out with a stellar motherboard to tempt your upgrading urges. Next is a duo of GTX580 cards, the powerhouses of the graphics world right now, followed by an actual powerhouse from Antec that provides enough power to fry an egg – wirelessly.

All this is rounded out by a trio of speedy solid-state drives, and another trio of cases ranging from super-cheap to very expensive. We've certainly run the gamut of devices this month!

And to top it all off we've taken a look at the best AM3+ motherboards for upcoming AMD Zambezei processors. Don't know which one to pick when Bulldozer comes a-knockin'? With Atomic's help you'll come out a-rockin'.

HARDCORE CONTENTS

HOW WE TEST

We do a lot of testing in our labs, and we look long and hard at every piece of hardware to determine whether or not it passes muster. From taking a new card out of its packaging, to bundled extras, to performance, every facet of a given piece of kit's 'user experience' is under scrutiny.

In some instances, we have tough benchmarks to help us rate gear. For a CPU or a graphics card, raw performance is, of course, the most vital stat as whether it stinks or smells like roses, as well as the ability to overclock well. But there are other things we pay attention to in the review process.

Value for money is an important consideration, especially in the current financial climate. High end gear is expensive enough as it is, so we look for good bundles. For instance, a graphics card that comes with a game or two, all the cabling you'll need, and little surprises like tools and other bumpf will score higher than a card that costs similar, but doesn't give you any presents.

Build quality is another thing we rate. From a PC case to a motherboard, we like our hardware well-made and capable of a taking a bit of punishment. We also like any included manuals to be clear and concise.

A lot of what we look for can be hard to put into numbers, we admit, but we try to think about what any enthusiast would think about their new gear after laying down money for it, installing it, and then using it.

And our benchmarks help, too. We've picked a suite of games and applications that anyone can get access too, so that you – the reader – can easily compare your own gear with the kit we have in each issue. In fact, we'd recommend to all our readers that they run all of these tests on their systems and save the results, so you can always have a familiar benchmark of your own to compare to the latest gear in Atomic.

UNIGINE HEAVEN 2.1

Our shiny Alienware-powered Gaming Lab, where we do most of our game reviewing and peipheral testing.

CPU Benchmarks:

Hexus PiFast

http://pifast.hexus.net/pifast.php

PiFast is a program that essentially calculates pi to a set amount of decimal places. It is a single-threaded application (one core/thread) and we run it at ten million places (10, 000, 000) using the Chudnovsky method, in the standard mode with no compression, and a FFT length of 1024kb. The program is free, so grab it and run it on your CPU. Memory bandwidth plays a significant role in the final performance of this program, so be sure you bump up the frequency as well as the CPU clock!

wPrime

http://www.wprime.net/

"wPrime uses a recursive call of Newton's method for estimating functions", says the website as it attempts to explain in plain English what it does. What it does do is, essentially, complex square rooting and other number functions, which are able to be split up evenly between multiple cores, or simply run on a single core. We use wPrime 32M in both single and multi-threaded runs. The results of the single run are divided by the results of the multi run, and this gives us the efficiency of the CPU being tested – very useful knowledge to have when comparing chips and evaluating the benefits of overclocking.

Cinebench R10 x64

http://www.maxon.net/pages/download/cinebench_e.html

Cinebench is a stalwart benchmark, and is one of the more entertaining ones to watch. It focuses on rendering an image at 800 x 600 resolution, complete with ray-traced light effects and much more. It can be run in either singlethreaded or multithreaded mode, and efficiency is calculated the same way as for wPrime. The program also supports up to 16 threads in total, and even eight threads with Nehalem is an impressive sight to see. The difference in performance between 32- and 64-bit is minimal – just keep that in mind if your results for the same setup are slightly different.

Everest Ultimate Edition

http://www.lavalys.com/

Everest is a system information tool that monitors voltage, temperature, as well as reporting on a massive list of other areas of your system. Hardware and software are noted here, but perhaps the most useful part of this program is the memory benchmarks. Ready for the fastest of dual/tri-channel memory, this tests the read and write bandwidth as well as latency. The program is a small download, but keep in mind that you only get a thirty day trial until you purchase the full version – something recommended if you're into getting the most info about what your tech is up to.

GPU Benchmarks:

Crysis

http://www.ea.com/crysis/

Crysis is one of those games that can scale from Average Joe's rig all the way to the beastly Dream PC in Kitlog; but due to recent graphics card releases we needed to bump it up a notch. Our testing now uses a standardised timedemo run, with all settings on high at a resolution of 2560 x 1600. While we can't run any antialiasing at this res and still get playable framerates on most cards, it's still more than enough to really give cards the workout they truly deserve.

Lost Planet 2

http://www.lostplanet2game.com/

Lost Planet 2 from CAPCOM may not have been a big seller, but its technology is a great implementation of DirectX 11 in version 2.0 of Capcom's existing MT-Framework game engine. It forms part of the atomic benchmarking suite due to its use of tessellation and other features in an actual game setting. Our tests use the freely available benchmark version of Lost Planet 2 and are run fullscreen at 1920 x 1200 with 8x antialiasing and 8x anisotropic filtering. Tessellation is set to Maximum and all the other settings cranked right up. Results are given in frames per second.

Unigine Heaven 2.1

http://unigine.com/products/heaven/

A synthetic benchmark built specifically to harness the latest and most demanding features of DirectX 11, Heaven is one of the best ways to test a card's tessellation capabilities. With a built-in timed run around a fully realised world, this benchmark taxes cards significantly and puts them under serious stresses. We test at a resolution of 1920 x 1200 using 8x MSAA and 8x AF, completing two runs of the built-in benchmark. The first run is with tessellation set to 'extreme'; the other 'none'. This highlights how well the cards can handle DirectX11 features and what they'll be like in a game that doesn't use the effect.

3D Mark 11

http://www.3dmark.com/3dmark11/

It really wasn't that long ago that we were introducing readers to 3DMark Vantage, but the relentless pace of hardware creep has led to a whole new benchmark, 3DMark11. Designed to measure a PC's gaming performance this latest version makes extensive use of all the new features in DirectX 11 including tessellation, compute shaders and multi-threading. We test using the Extreme preset, which runs at 1920 x 1080(p); this is designed to push even high-end systems, so we feel it's indicative of exactly the loads Atomicans expect from their gaming rigs.

GIGABYTE G1-Killer G1.Sniper 2

Taking aim at Ivy Bridge.

Street Price $440 **Supplier** GIGABYTE
Website www.gigabyte.com.au

Specifications Socket 1155; Z68 chipset; ATX form factor; 2 x PCI-e x16 (1 x 16x, 1 x 8x electrically); 2 x PCI-e 1x; 2 x PCI; 3 x SATA2, 4 x SATA3; DDR3-2133

The second generation of GIGABYTE's well received G1-Killer rage has arrived on the scene, but you wouldn't pick it judging by visuals alone. Green and black are still in, married with the same iconic ammunition magazine heatsink, and a familiar board layout. In fact, the main visual difference is an added MOSFET heatsink to the side of the CPU socket.

As you may recall, there were three board variations in the Killer range, namely the Guerrilla, Sniper and Assassin boards, in order of expense and features. The original series thrust itself directly into the aging (but solid) X58 platform, which has the advantage of greater PCI-e and memory bandwidth. The new series so far consists only of the G1.Sniper 2, the midrange of the three previous offerings, and sports Intel's latest Z68 Express chipset.

PCI-e 1, 2, now 3!

If you thought saturating PCI-e 2.0 was a challenge, get ready for another generation of everyone's favorite peripheral bus. Existing motherboards use PCI-e 2.0 to communicate data from the various expansion cards to the CPU for processing. This bus transfers data at 500 MB/s per lane (that's a 16GB/s transfer for a full sized 16x slot, in both directions), with a base clock of 5GHz, and a transfer rate of 5GT/s.

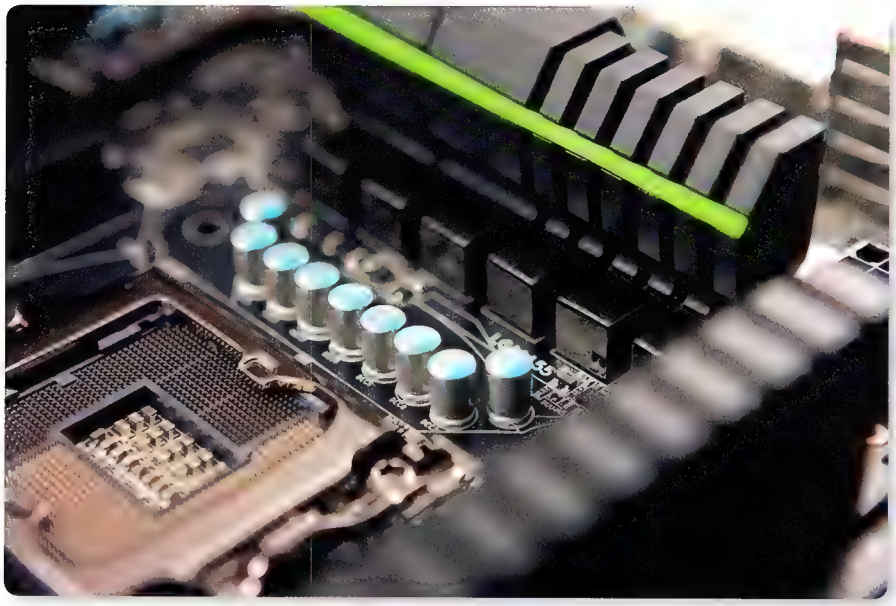
PCI-e 3.0 effectively doubles the bandwidth of PCI-e 2.0 to approximately 1GB/s per lane, with a transfer rate of 8GT/s. You may be wondering why the transfer rate didn't double to 10GT/s: the answer lies in the encoding of the bus which has been changed from the 8b/10b to 128b/130b encoding scheme. The result is a large reduction in performance overhead, from 20 per cent down to 1.5 per cent.

The beauty of the PCI-e 3.0 specification is that PCI-e 3.0 cards can function in older PCI-e slots, and older cards will function in the new slots. However, there's one small caveat; you'll need an Ivy Bridge processor to take advantage of the extra bandwidth. The reason for this is the recent (since Lynnfield) reallocation of the PCI-e controller from the motherboard to the CPU die.

There's two PCI-e 16x slots available for use, so only 2-way SLI or Crossfire setups can be installed on this board, where each card is allocated 8 PCI-e 3.0 lanes.

A shot to the head for X58, P67

It's become a no brainer for technicians to opt for the Z68 platform over the reigning champions P67 and X58. Z68 is a direct upgrade of the existing features of P67, so there's little point pushing P67 anymore. As for X58, the raw performance of Sandy Bridge microprocessors over Nehalem says it all. 5GHz is an easy feat on our 2600K, and quite a challenge on the i9xx



range of Nehalem based processors. Add the fact that this motherboard has BIOS support for Ivy Bridge - the 22nm successor to Sandy Bridge - and we can only imagine the overclock gap between X58 and Z68 widening further still. So long, X58!

genre) is highly reliant on good audio to hear enemies approaching, and to get a complete sense of situational awareness. We're pleased to see the Creative CA20K2 chip make a return from the original G1.Sniper, the audio chip featured on many X-Fi cards. With an impressive signal to noise (SnR) ratio of 109dB over multiple channels, there's really no need to replace this inbuilt solution with an external card unless you're very picky about your audio hardware. The downside is that when you upgrade your motherboard, you can't take it with you.

If you thought saturating PCI-e 2.0 was a challenge, get ready for another generation of everyone's favorite peripheral bus...

Killer NIC, killer audio

The latest craze on gaming motherboards these days is the Bigfoot Networks Killer E2100 chip. We've seen them on many gaming orientated motherboards, including the ASUS ROG range. We've touched on this in the past - the claim is that by using techniques such as 'Windows network bypass', the performance of network oriented game play is improved. The E2100 will not offload processing to the CPU, freeing clock cycles for other tasks.

Competitive gaming (in particular the FPS

Make no mistake, the G1.Killer 2 is a premium piece of kit. If the specs don't make that clear, then perhaps the bundle will convince you. Included is a 5.25in front access panel with 2 x USB 3.0 connections, a powered eSATA port, and our favorite turbo-esque Quick Boost button, for overclocking at the touch of a button. You also get the black coloured SATA cables, a SLI bridge, and stickers! Everyone loves stickers, right?

Connectivity on the back panel of the G1.Sniper 2 includes 7x USB 2.0, 1x combined PS/2, a CPU overclocking button, 1x USB/eSATA combo, 2x USB 3.0, 1x Gigabit LAN and 5x audio jacks + optical S/PDIF out. The OC button takes the CPU to a modest 4.2GHz on a 2600K and 4.1GHz on the 2500K (i.e. it increases the CPU multiplier by seven, and disables Turbo Mode).

Does it kick arse?

We've met the G1.Assassin previously, and were very impressed by the board. We weren't so keen on the cost. The Sniper 2 is certainly cheaper, but can it match the X58 variant in performance and features?

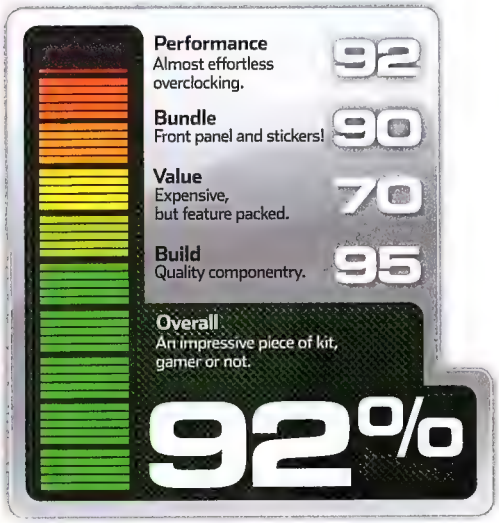
We entered the familiar blue BIOS screen and got right into tweaking. We started off by setting the core voltage to 1.45v and ramping up PWM and Over Current Protection to avoid being held back. The memory was then set to 1866MHz and the CPU multiplier to 50x for a 5GHz overclock. After confirming stability with Prime95, a 51x multiplier was used, and then 52x which didn't last too long under stress. Reducing the base clock to 99.5 MHz and increasing the voltage to 1.49v (level 7 LLC) scored us a stable overclock of 5174MHz, which is an admirable achievement. We couldn't raise the memory clock to 2133MHz without very loose timings, so we stuck to the default XMP profile throughout.

Compared to the ASUS Sabertooth P67 we reviewed in June, the extra 150MHz gives the G1.Sniper 2 a clear advantage in benchmark scores, bar the Everest read test due to the lack of a memory overclock. It even gives the G1.Assassin a run for its money - the X58 platform struggles to compete.

If the previous G1.Killer range enticed you, but the price or platform held you back, we highly recommend this board. We're eager to try an Ivy Bridge processor with it! VC

GIGABYTE G1-Killer G1.Sniper 2

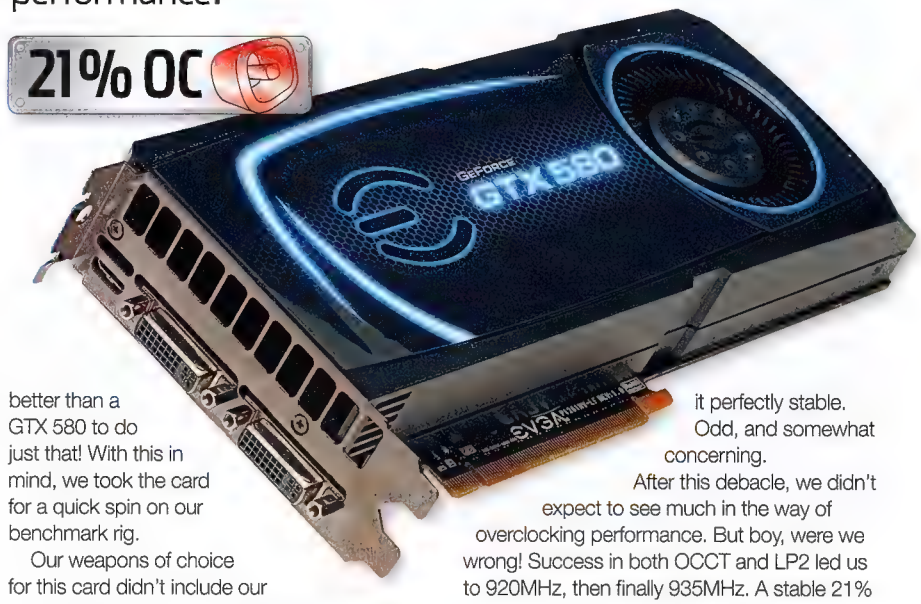
Intel 2600K	38x100; 9-9-9-24 T2 1866MHz	50x100; 9-9-9-24 T2 1866MHz	52x99.5; 9-9-9-24 T2 1866MHz
PiFast	19.23s	14.73s	14.29s
wPrime 32M - single thread	36.629s	27.845s	27.052s
wPrime 32M – multi-thread	9.424s (3.89x efficiency)	7.236s (3.85)	7.053s (3.84x)
CineBench R10 64bit - single thread	6440	8382	8684
CineBench R10 64bit - multi-thread	22835 (3.55x efficiency)	29903 ()	30574 (3.52x)
Everest Read	21005 MB/s	22837 MB/s	22769 MB/s
Everest Write	19783 MB/s	24917 MB/s	25495 MB/s
Everest Latency	41.5 ns	39.2 ns	39.2 ns



EVGA GEFORCE GTX 580 3GB

Reference design = reference performance?

Street Price $629 **Supplier** EVGA
Website www.evga.com.au
Specifications 772MHz core; 1002MHz memory (4008MHz effective); GF110 core; 512 unified shaders (CUDA cores); 3072MB GDDR5; 384-bit bus width; dual slot active cooling; 6-pin + 8-pin PCIe power connections
Card info www.techpowerup.com/gpuz/2mk8s



In a market jam packed with a delightful selection of fancy custom cooler shrouds, port options, fan variations, and borderline hallucinogenic boxes, EVGA's card looks jarringly normal. A nice normal, the kind of normal which takes you back almost 10 months where this very design wet the pants of many a geek. EVGA has embraced the very heritage of the GTX 580 design, with a mere splash of electric blue to make it unique. Oh, and this card is sporting 3GB of DDR5 under the hood!

Memory is an interesting asset to consider when it comes to choosing a graphics card. It's not uncommon for novice technicians to jump to the conclusion that a card with more memory will outperform a card of the same generation with half the memory, particularly when it comes to gaming. It's simply not the case. Manufacturers often choose to capitalise on this flawed logic by implementing insanely high amounts of memory on their lowest end cards, to make them appear more valuable over similarly priced competitors (case in point, who's up for a 2GB HD5450?).

This begs the question, when is more memory beneficial? The answer is quite simple: it's a valuable asset when you're running a large resolution set up, typically consisting of multiple monitors. This is where cards such as the 3GB EVGA GTX 580 really shine. Naturally, this requirement for such a large wad of memory only makes sense if there's raw power behind it to push the pixels out, and there's very little better than a GTX 580 to do just that! With this in mind, we took the card for a quick spin on our benchmark rig.

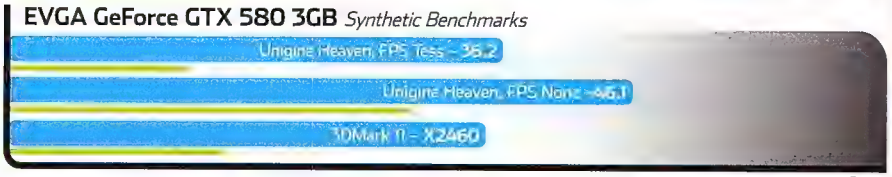
Our weapons of choice for this card didn't include our favorite overclocking tool 'Afterburner', we decided to use EVGAs own tools, which gave us access to voltage adjustments on this particular card. These tools include EVGA E-Leet and Precision, of which the latter is actually developed by the same author as Afterburner.

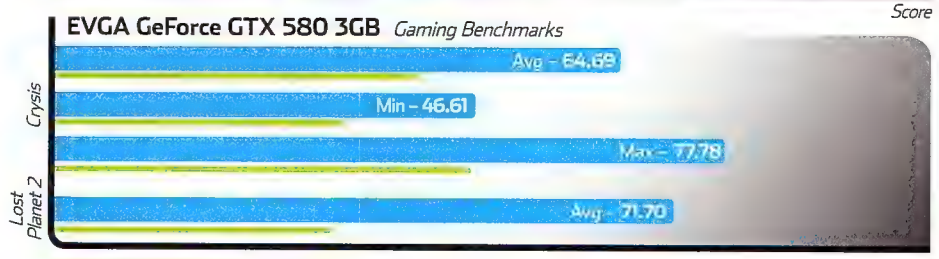
Our first attempt at overclocking was with the stock voltages, and a clock rate of 850MHz. Usually we go straight into OCCT to check for stability, but from past experience, the Lost Planet 2 benchmark has picked up issues not detected by traditional stress tests. A few seconds into Test A of the LP2 benchmark, the display drivers crashed, leaving us to tweak further. As it turns out, the LP2 benchmark refused to run at stock settings too! After ruling out potential driver and Windows issues, we found that increasing the core voltage made it perfectly stable. Odd, and somewhat concerning.

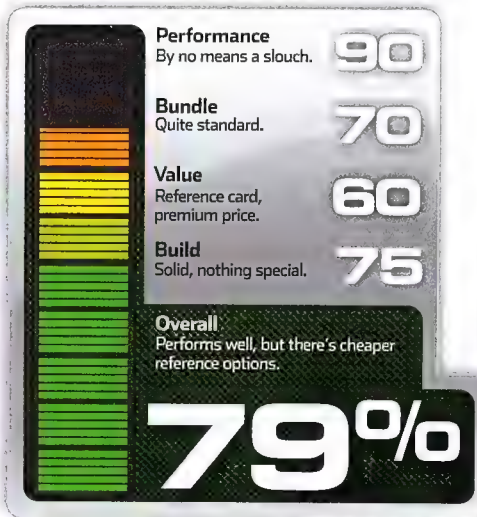
After this debacle, we didn't expect to see much in the way of overclocking performance. But boy, were we wrong! Success in both OCCT and LP2 led us to 920MHz, then finally 935MHz. A stable 21% overclock on the core! Not bad!

Let's not forget about the goodies the card comes with. A DVI-D to VGA adapter, dual Molex to 6-pin power adapter, a dual 6-pin to 8-pin power adapter and a DisplayPort to HDMI adapter are included with the card. The connectivity of the card is stock standard - a mini-HDMI port, and two DVI-D ports.

All considered, this is quite an impressive card. The main drawback is the noise output due to the reference cooler, followed closely by the stability issue at stock (which may very well be a case of a bad sample). Compared to the ASUS DirectCU II GTX580 we reviewed in the May issue, this card performs better in the synthetic benchmarks, and about the same in Crysis. Is this card worth the $50 price premium over other 3GB reference cards? We're not completely convinced – we'd love to see a version with a non-reference cooler. VC



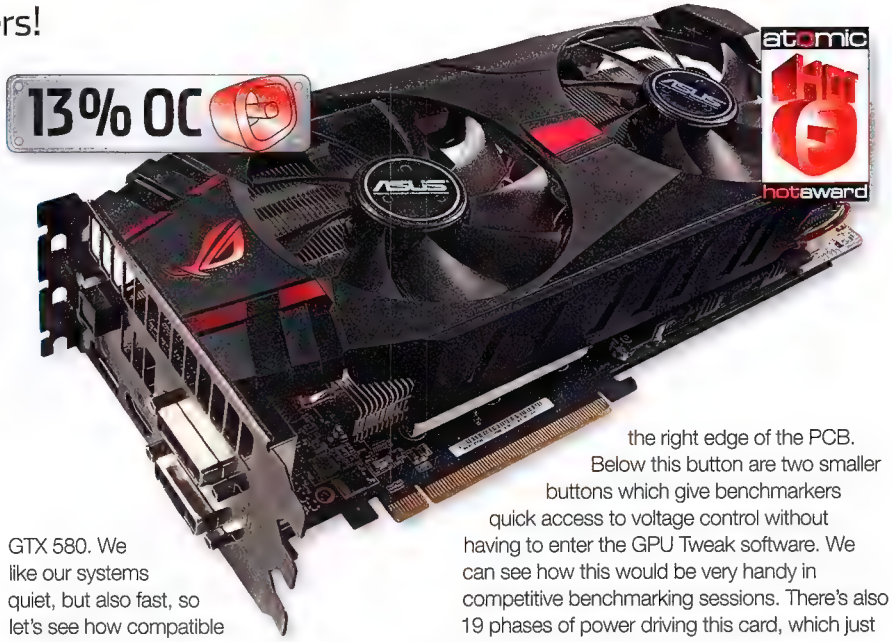




ASUS MATRIX PLATINUM GTX580

Many buttons for itchy fingers!

Street Price $695 **Supplier** ASUS
Website www.asus.com.au
Specifications 816MHz core; 1002MHz memory (4008MHz effective); GF110 core; 512 unified shaders (CUDA cores); 1536MB GDDR5; 384-bit bus width; triple slot active cooling; dual 8-pin PCIe power connections
Card info www.techpowerup.com/gpuz/kheeg



Of late, we've noticed that card length isn't the only dimension getting stretched to the limits - width is playing a role in assisting the evolution of our beloved graphic processing gear. It's intriguing that this is becoming a trend, given that multi-slot cards have a history of being frowned upon. With great width comes greatly reduced chance of having a multi-card setup, and this isn't something enthusiasts have been particularly keen about.

Times have changed, however, and having a single card in an enthusiast system is perfectly valid in even the most hardened of geek communities. Take our very own Atomic forum, for example. Not one of the recent community designed systems has more than a single card listed. There's two reasons why this is the case. The first is that single slot cards are already very powerful, and with the current gaming environment so saturated with console ports, there isn't much out there to really push a card to its limits. The second is that adding multiple cards will not give a linear performance increase, and there's no guarantee that a particular game will scale well. Both Crossfire and SLI are dependent on driver updates to maintain performance scaling.

So what do we have to gain from moving from a two slot width card to three slots? Cooling performance and efficiency. ASUS claim that their system provides "600% greater airflow and 20% cooler performance" than the reference GTX 580. We like our systems quiet, but also fast, so let's see how compatible these ideals are on this card!

Using ASUS GPU Tweak software, we ramped up the voltage to 1.15v, with the intention of pushing the card as hard as it'll go. The card comes pre-overclocked from the standard 772MHz rating; we can do better than that! 900MHz was dialed into the software, which was suitably stable according to both OCCT and Lost Planet 2 tests. Going up in increments of 5, we found the stable limit at 920MHz. Not as high as we had hoped, but respectable nonetheless. The memory clocks were also subject to our appetite for raw power, and it was not long until we hit 1176MHz, up from 1002MHz.

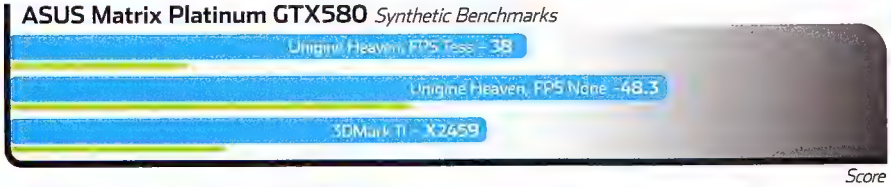
To allow for such high clock rates, we used the convenient 100% fan button located on the right edge of the PCB.

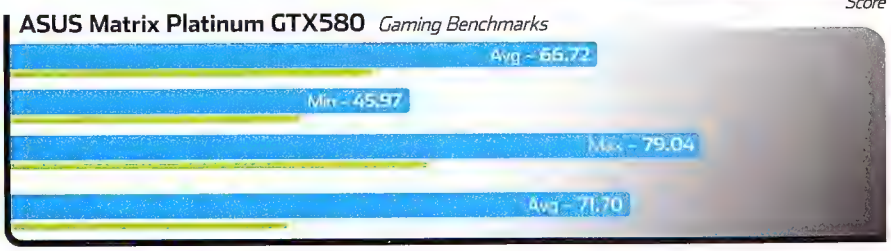
Below this button are two smaller buttons which give benchmarkers quick access to voltage control without having to enter the GPU Tweak software. We can see how this would be very handy in competitive benchmarking sessions. There's also 19 phases of power driving this card, which just screams out for water cooling.

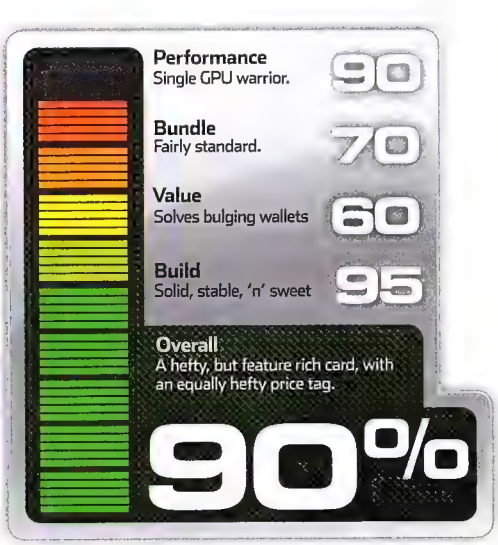
The GPU Tweak software has some very nifty features, including the ability to 'burn' settings into the onboard BIOS as a permanent configuration. Naturally this feature comes with the potential to royally screw something up, so ASUS implemented a 'Safe Mode' button which clears the BIOS back to defaults. It's not just core and memory clocks you can adjust, either - there's about a dozen DDR5 timing variables that are just itching to be tweaked!

Comparing this heavily modified card to that of the reference EVGA card also reviewed this month, it's clear that the performance of this card is a tad higher in real world benchmarks such as Crysis, but slightly lower in 3DMark 11.

This card is for serious benchmarking, by those who wish to tweak their cards to the brink of death, and then some. **VC**







OCZ Vertex 3 240GB

Blazingly fast SATA 6Gbps performance.

Street Price $539 Supplier OCZ
Website www.ocztechnology.com
Specifications SandForce SF-2281 Controller; SATA 6Gbps support; 2.5in form factor; 240GB Capacity

It is fair to say that SSD technology has been a little slow this generation. We first saw SATA 6Gbps ports showing up on AMD motherboards last year, and they now also appear in small numbers on Intel platforms as well. But despite the fact that SSDs are much more in need of the extra bandwidth than mechanical drives it has taken a long time for them to support the new standard.

Drives based upon Sandforce's SF-2281 controller have been shipping for a few months, but initial samples were delayed due to issues with 120GB drives. Corsair, for example, recalled theirs, while OCZ decided to push firmware updates to fix it. Other companies just delayed shipping products until the problems were ironed out. The issues are behind us now, so it's time to take a look at what these lumps of flash and metal offer.

In a nutshell, they offer huge boosts over previous generations. The OCZ Vertex 3, which uses Sandforce's SF-2281 controller, managed to deliver 229.66 MB/s in AS-SSD's 4k-64Thrd read test and wrote at 195.94MB/s in the write version of the test. This is significantly more than the results seen with the previous generation of drives, however it is still lower than OCZ's PCI-Express Revodrive series. The 240GB Vertex 3 is also priced quite near to the 220GB Revodrive, and we do think that the loss of 20GB is worth the performance boost.

That said the Vertex 3 is a great 2.5in SSD. It managed to eke out a slightly faster result than the other drives on this spread, and builds on the great reputation of the Vertex 2. Anecdotally the 240GB versions of the drive are a touch faster than the 120GB models thanks to differing designs, but when looking for street pricing we noticed at many places that the 120GB cost just under half the price of a 240GB. Assuming you have the SATA 6Gbps ports available (remember that Intel's chipsets only have two such ports) then running a striped RAID between two 120GB drives will provide better performance still. JG

Overall
A speedy SSD at a fair price.

91%

Kingston Hyper X 240GB

Blindingly quick SATA 6Gbps performance

Street Price $549 Supplier Kingston
Website www.kingston.com
Specifications SandForce SF-2281 Controller; SATA 6Gbps support; 2.5in form factor; USB 2 external drive chassis; Acronis True Image HD backup software; 240GB capacity

Kingston is now a veteran player in the SSD market, however its drives have historically been targeted at the budget end of the range. This has largely been down to the controller chips used, which have comes from companies like JMicron and Toshiba. While this has played well into Kingston's budget strategy, the performance space has been beyond them.

Until now that is. Announced at Computex, the HyperX branded SSD is the first Kingston model to use a Sandforce controller. It is the same SF-2281 chip used by OCZ in its Vertex 3, and it brings Kingston firmly into the performance SSD space. A simple glance at street pricing confirms that this isn't designed to replace the existing SSDNow line of products – at $289 for a 120GB model it's a touch more costly than the OCZ, while the 240GB model comes in at $550, just below the OCZ one.

By employing the HyperX brand that has been so successful in the memory space Kingston has declared the SSD to be a performance part, and the results bear this out quite well. Sequential reads topped out at 505.33MB/s in AS-SSD and in the crucial 4K-64Thrd tests we saw a read speed of 213.57 MB/s and a write speed of 227.99 MB/s. These writes are a touch quicker than the Vertex 3, but we should point out that it also used more recent firmware than the review product from OCZ did.

These results highlight the general problem with the SSD market. Now that technologies like TRIM and Garbage collection are common and all the drives in the performance space are using the same controller, there is very little to differentiate between brands. Kingston has a few novelties up its sleeve, designed to make its drives stand out – namely an 'upgrade kit' that includes the usual 2.5 to 3.25in drive adapter but also a (disappointingly) USB 2.0 external case for the drive as well as a screwdriver and a copy of Acronis' true image HD software for imaging your current drive.

It's a nice package, but apart from the software we don't really see it getting much use. The real value is in the performance of the drive, which is fantastic. JG

Overall
Slightly less value, but still speedy.

90%

Antec HCP 1200

Only the power-hungry need apply.

Street Price $315 **Supplier** Antec
Website www.antec.com
Specifications 1200W; 80 Plus Gold rating; SLI and Crossfire certified; 2 x 8 pin CPU connectors, 4 x 6 or 8 pin PCI-E connectors; Captive ATX 24 pin connector; 8 x 12V rails

In the varying products that make up Antec's PSU range, the High Current Pro series sits at the high end. With an 80 plus gold rating and large capacities, the HCP is designed for those with heavy power needs such as those seen when running multiple graphics cards. We have been testing the 1200W model in the Atomic labs, although we have also played with the lesser 750W and 850W members of the lineup.

One of the major selling points of the HCP design is the number of 12V rails inside the unit. There are eight such rails inside the HCP-1200, and Antec claims that they all operate at 99% efficiency. It uses a modular design, with a captive 24-pin ATX connector and two eight pin CPU plugs. This captive bundle is rounded out with two PCI-E power cables (each supporting dual six or eight pin connections) and two SATA power cables. The rest are removable, although unless you add a third graphics card or many more hard drives they will likely go unused.

We have been using the HCP 1200 on our testbench for a month and had no problems with anything we threw at it. Our multimeter tests show that the Voltages are quite solid, and the PSU has generally been a joy to use. As always it is important to keep in mind your planned usage when choosing a PSU. While the HCP is great for multiple GPU systems and similarly high drain environments, it is overkill for a simple gaming rig – there's a reason Antec has several different lines of PSUs.

This becomes apparent when you look at pricing. At $315 the HCP-1200 is targeted well above what mere mortals will pay for power. A 900W High Current Gamer comes in at half that pricetag, and will deliver ample performance for a normal SLI system. But if you're building a monster system, then this is a pretty great PSU to use. For the rest of us, it is both more than we need and the price premium would probably be better spent getting a less godly PSU and putting the savings into speedy componentry. JG

Overall
A wonderful product that is overkill for most mortals.

87%

Patriot Wildfire 120GB

Impressively Zippy SATA 6Gbps performance.

Street Price $309 **Supplier** Patriot
Website www.Patriotmemory.com
Specifications SandForce SF-2281 Controller; SATA 6Gbps support; 2.5in form factor, 120GB capacity

By the time we arrive at our third SATA 6Gbps SSD this month a clear pattern is emerging. Like the other two drives on this spread, Patriot's Wildfire uses Sandforce's SF-2281 controller. It is the most expensive drive to hit the Atomic labs this month, coming in with a street price of $309 for the 120GB version.

There really isn't much other than price to distinguish Wildfire's Patriot 120GB from the Vertex 3 and HyperX drives. It comes with the usual 2.5 to 3.25in adaptor but that's it for the bundle. Performance wise it is just behind the Vertex 3 and the Kingston Hyper X (though in practice the difference is negligible). It delivered the fastest sequential reads, with 510.47 MB/s but the lowest results in the 4K-64Thrd test with 194.27 MB/s read and 198.06 MB/s write.

Unlike last generation, where the performance difference between drives was clear, these newer Sandforce based drives will end up competing largely on price. We have no hesitation just recommending the cheapest you can find, or go with the brand you are loyal to. Apart from niches like OCZ's RevoDrive product, the SSD market is rapidly becoming homogenised and commoditised.

An SSD will still be the best upgrade you can add to an existing system, but if you are looking at building anew the real challenge is now SSD vs Smart Response. Intel's Z68 based HDD caching technology is not as fast as using a boot SSD, but it's close, and has the advantage of speeding up the programs you actually need. True performance junkies will still want pure SSDs, but if you are that focused on IOPS you'll want to be looking at RAID or a PCI-Express based solution.

Patriot's Wildfire is yet another great SATA 6Gbps SSD, but there is nothing that lifts it out of the pack. It looks very much like this is the way that the entire SSD market is headed, and it ultimately benefits the consumer who is able to shop around for the best priced product. JG

Overall
Another solid drive.

90%

MSI GT780

Experience the Golden Triangle.

Street Price $2099 **Supplier** MSI
Website http://au.msi.com

Specifications 2GHz Core i7 2630QM, 8GB DDR3, GeForce GTX 560M, 750GB 7,200rpm HDD, 17.3in 1920 x 1080 screen, Dynaudio Sound, Steelseries keyboard, 2 x USB 3, 3 x USB 2, GbE, 802.11b/g/n, Bluetooth 3.0 SD Reader, eSATA, HDMI, 5.1 audio outputs.

MSI has made a bit of a habit in recent years of bringing out monstrously powerful gaming laptops. The latest to bear this legacy is the GT780, a wedge of black plastic and alloy built around a Core i7 2630QM and a GeForce GTX 560M. There's also a rare non-glossy 1920x1080 LED backlit screen and a major new addition to MSI's lineup, a keyboard designed by gaming brand Steelseries.

Looks are one of the few ways that the competing gaming laptop brands define themselves, and without a doubt the design of the MSI GT780 is polarising. Some around the Atomic labs love the design, whereas others find the thick, heavy wedge of black to lack panache. It is certainly a far cry from the sleek lines of Razer's ultra thin Blade, for example (**www.atomicmpc.com.au/?268281**).

But ultimately the size and heft of the GT780 doesn't matter. This is a laptop designed for gaming, with specs pumped up significantly in important areas. In the truest desktop replacement sense, it doesn't care to be used on the go, instead it is designed as a serious bit of gaming hardware. In this sense it succeeds magnificently, with the combination of Core i7 2630QM CPU and GTX 560 demonstrating themselves remarkably capable.

MSI GT780

Unigen Heaven - No tess	18.3 fps, 461 score
Unigen Heaven - Ttess	9.5fps, 239 score
Cinebench – single thread	4384
Cinebench – multi thread	17082
3DMark 11	P2021/ X613

In our Crysis benchmarks, for example, we saw the GT780 managing to average 32 fps in our high detail test. In fact, it coped easily with everything we threw at it. Of course, we are still talking laptop-level performance so don't expect the sort of high end gaming you get with a desktop system, but the GTX 560 in particular helps the GT780 to a level of performance higher than we usually see.

It isn't the highest end GPU out there - Alienware has a GTX 580 based 17in model for example – but it is a step above the common GT 540 and GT 555 GPUs.

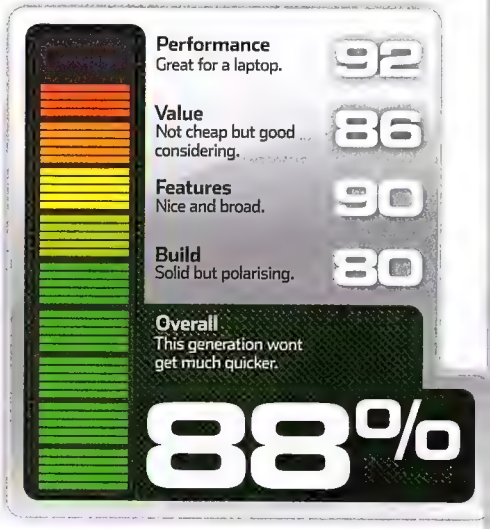
There is ample performance under the hood, but its also a spec that can be obtained from other laptop manufacturers. So what MSI has done is focused on the chassis, most specifically the audio system and the keyboard. The GT780 uses speakers designed in collaboration with car sound specialists Dynaudio, part of a relationship announced last year. This makes for some fantastic audio, and if you are using this as a primary entertainment PC then it is a very welcome addition (as a LAN box the attention paid to speakers goes to waste as headphones become the preferred source of noise).

Just under these distinctive-looking speakers sits MSI's big selling point, the Steelseries keyboard. Much like Alienware's laptops, this comes with customisable backlighting, allowing you to set up everything from a subtle red glow all the way to pulsating multi-coloured hand disco. The end effect is a little odd, as the chiclet keyboard allows light to bleed out from all angles (it looks a bit strange when sitting at the laptop).

The feel of the keyboard is fantastic though, with the relatively short travel keys nice and bouncy. It is a full size keyboard too, with a few gaming-centric changes. As part of a design dubbed 'the Golden Triangle' the Windows key has been moved to the right hand side in order to avoid accidental jumps to the desktop (although if you are used to hitting shortcut keys in windows it takes quite a bit of readjustment).

The touchpad is quite good, with distinct clicky buttons rather than an integrated design. This is fine for windows, but when gaming it can be disabled with the push of a button. Unfortunately for reasons unknown MSI has located the touchpad slightly to the left of centre. What results is a somewhat uncomfortable hand placement when using the keyboard, with this writers left palm sitting half on the touchpad. Considering the importance of ergonomics for long gaming sessions, this seems a strangely uncomfortable bit of design in an otherwise well thought out chassis.

As long as you value performance over portability, and agree with MSI's asthetic choices, this is a pretty dang good gaming laptop. At a touch over two grand it isn't cheap, but it packs a robust range of hardware which in turn translates to some great performance. We do wish the touchpad didn't interfere with our palm so much, but there is some pretty decent gaming to be had from this beast. **JG**

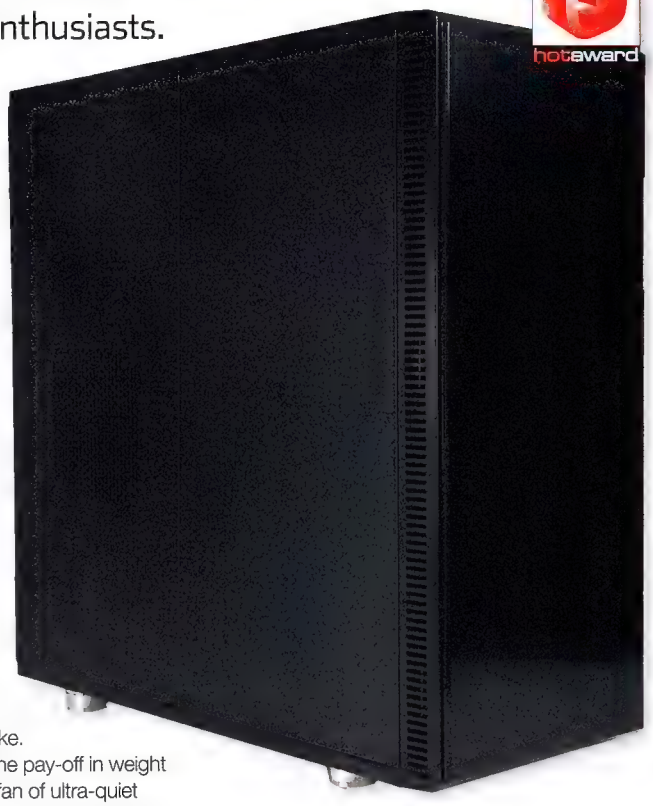


Fractal Design Define XL

An epically quiet design for silent computing enthusiasts.

Street Price $220 **Supplier** Anyware
Website http://fractal-design.com

Specifications 17.9kg; 232 x 560 x 561.3mm (W x H x D); 7+1x expansion slots; 4x 5.25in drive bays, 10x 3.5in drive bays; 1x 140mm fan (front), 1x 180mm fan (top), 1x 140mm fan (rear); 4x USB2, 1x eSATA, 1x Audio. Mini-ATX up to E-ATX compatible.



Fractal Design is known for producing solidly made PC cases that are very quiet, and its new Define XL ticks both of those boxes with understated style and definite panache. It's also just about the heaviest case we've ever had to lug around the labs, and if you're at all interested in being able to handily move about your rig, then we're gonna say up front: this is not the case you're looking for.

However, if you want a sleek, roomy and above all quiet build option, there are few better choices in the market today.

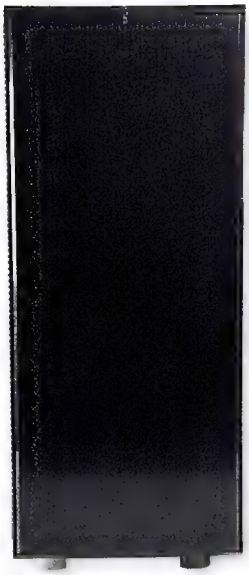
Externally the Define XL is heavy duty, but remains sleek thanks to a door panel that keeps the important bits of the machine hidden away behind glossy black plastic. Above this shiny fingerprint magnet are the usual IO options and power buttons, though the lack of USB3 is noticed. It's not a deal breaker, but most other mid-to-high-end cases are coming with that option these days.

With the door open, though, there's a mess of coolness. The ODD bays feature handy clip-out brackets, and behind is a two-bay tall filter panel that can be easily popped out if you want to install more than one 5.25in device. There's a second, smaller door below the ODD bays, and opening this reveals another filter, this time protecting one 140mm fan, and a mount for a second. It's all a very tidy arrangement, and the inside of the door also features light foam for extra sound-proofing. And that's just the start of the noise-fighting additions Fractal Design have added to the Define XL chassis.

There's a vacant grill on the side-panel where you can mount an extra fan, and the other panels are pretty much business as usual. Removing the sidepanel shows off the rest. In fact, you really start to see why the case is so heavy – even this one panel seems to weigh a tonne. The reason is the insulation Fractal Design uses; a bitumen-based material that absorbs and dampens any noise your PC may make. It really works a treat, and the pay-off in weight is totally worth it if you're a fan of ultra-quiet computing. There's even a removable cut-out of this bitumen stuff if you want to mount a side-panel fan. Your machine will make more noise, but run cooler – your call.

The rest of the interior is divided into three distinct 'thermal zones'. You've got your main bay, with mobo plate and two fans exhausting hot air up and out, your ODD bays, and then at the bottom of the case a huge amount of HDD bays (one whole rack of these can be removed for longer video cards), featuring tool-less caddies and rubber grommets for quietness, and a neat PSU mount with heavy rubber feet to isolate vibration and boost airflow. It's a bit cramped, though, so beware PSUs longer than 18cm.

It's not a cheap case, but given the cooling options and incredibly efficient noise control, it's just about the last word if you want a powerful but quiet rig. The impressive HDD count is also great if you want to make some kind of storage-hungry mastering box. Regardless, this is a great case that you will love, but that your back might hate. **DH**



Build 89
Solid, yet oh so heavy.

Value 90
Pretty good, considering the soundproofing.

Cooling 88
One or two more fans would be perfect.

Features 93
Well-specced, USB3 absent.

Overall
Epic in almost every way.

91%

RAIDMAX Helios

It's certainly cheap, but we're not feeling all that cheerful.

Street Price $100 **Supplier** RAIDMAX
Website www.raidmax.com

Specifications 530 x 225 x 475mm (L x W x H); 3x 5.25in drive bays (external), 4x 3.5in drive bays (internal); 7x expansion slots; 2x 120mm fans (front), 1x 120mm fan (top), 1x 120mm fan (rear); 2x USB2, 2x audio, 1x eSATA; ATX and mATX form factor.

There is nothing wrong with a good, cheap case. However, those terms seem to be at odds with each other. The 'cheap' side of the equation is always cutting corners and being a jerk, while the 'good' side is simply a doormat. With the RAIDMAX Helio we have a cheap case and, once again, the good side is being a passive partner in a very messy relationship.

Externally the Helios is your classical aggressively-styled crowd-pleaser. There are engine intake-like fan mounts, odd extrusions on the leading fascia and rear panel to make it stand out from the pack, and a smoky side-panel window that seems to miss the entire point of having a case window in the first place. It's not bad, per se, but like all such stylings very much up to a builder's personal taste. However, to our modding-minded eyes it does at least look like some interesting lighting effects could be achieved that play up to that whole engine housing look.

Closer inspection, though, starts to show where the cheapness comes in. The ODD panels, which do have a handy clip-out function, shipped poorly made from the factory, with tufts of foam poking around the mesh facing (see main pic). It's not going to hurt case performance at all, but it is indicative of poor manufacturing and QA standards. The power and reset buttons do their job well enough, there's the usual array of IO options, and the case rear features some rather nicely contrasting blue expansion brackets.

Taking off the side panels reveals that cheapness again, as these are secured by tacky plastic thumb-screws – the devil's very playthings. The interior that's revealed is a uniform black, broken up only by the aforementioned brackets, blue fans, and one of the least reliable-looking tool-less ODD options we've ever encountered. The HDD bays aren't much better, but the outward-facing orientation is pretty neat. The caveat of going tool-less like this is that it takes someone like Lian Li to make it actually work – cases on the cheaper end of things really should stick with good old screws. At least the expansion brackets take this much more reliable tack.

The mobo backing plate features a handy cut-out for fiddly CPU coolers, but there's barely a pinky finger's worth of clearance behind it. If, like us, you plan on utilising this space to hide excess cabling out of the way, you're plum out of luck with the Helios – which means anyone building into this will have to be doubly clever with cabling to keep air flowing through the case.

In fact, scratch that: it's going to need triple-cleverness, as some of the fan mounts are downright dodgy. Out of the box, for instance, the upper fan is actually only half attached. Even worse, it's secured by very simple clips – and badly – so that when we tried to re-attach it we ended up popping out the extruded plastic panel decorating the rear upper portion of the case.

It's cheap, but it's a hodge-podge of features and problems. Even worse, when you consider the excellent BitFenix Shinobi is cheaper and much better (**www.atomicmpc.com.au/?260177**), the Helios simply becomes impossible to recommend in any way. **DH**

Build 59
Poorly assembled, dodgy tool-less options.

Value 64
You're not quite getting what you pay for.

Cooling 39
Lots of fans, but badly secured.

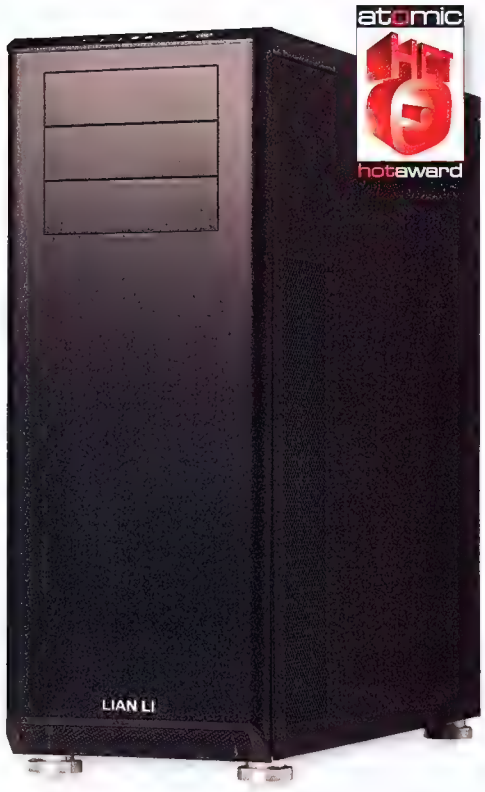
Features 75
Pretty average on this front.

Overall
You'll probably want to look elsewhere.

48%

Lian-Li PC-Z70B

The model name rhymes, so it must be good!



Street Price $465 **Supplier** Lian-Li
Website www.lian-li.com

Specifications 220mm x 600mm x 592mm (W x H x D); 8.8kg; 3 x 120mm fan (front), 2 x 140mm (top), 1 x 120mm (rear); 9 x hot swappable 3.5in, 2 x 2.5in, 3 x 5.25in bays; 11x expansion slots; HPTX/EATX/ATX/MATX; aluminium construction

Aluminium is a glorious element. The silvery substance is at the forefront of many modern electronic devices, acting as a lightweight yet aesthetically pleasing shield around our delicate computing kit. Such examples are HTC unibody phones, the popular Macbook Pro range, and this very Lian-Li case. Its natural corrosion resistance means it can be admired, without protective measures such as galvanisation. On the other hand, it's quite expensive.

The entirety of the PC-Z70 is made from aluminium. It was no surprise that when we lifted the Lian-Li to position it for careful inspection, the apparent weight compared to the likes of traditional steel cases was blatantly clear — it hardly feels like you're putting in any effort at all, despite being a full tower case. To be exact, it weighs a mere 8.8kg!

Lian-Li's PC-Z70 case comes in two colours, silver and black, as indicated by the last digit in the model name ('A' for silver, 'B' for black). We were sent the black version, which when opened, reveals a roomy grey aluminium interior. The first thing that jumped out as really cool were the numerous routes by which cables can be managed. Veteran PC builders and perfectionists alike will find great pleasure in using the numerous rubber-edged gaps in the motherboard backplate, which have been fitted to sit next to common port areas of modern ATX/E-ATX motherboards. Now you can hide those ugly fluro coloured SATA cables away from prying eyes! There's very little blocking access to the rear of the backplate, so there's no excuse for having stray cables lying out in the open.

Mechanical storage is cheap, so it's nice to have no less than nine hot swappable 3.5" drive bays at your disposal, plus two 2.5" bays for SSDs. Plastic dampner strips are applied to the sides of each drive using rubber-lined thumbscrews, which can then be removed and replaced tool-lessly. These bays are securable using an inbuilt key based locking mechanism, to reduce the ease of physical theft. Molex connectors power each drive via a custom PCB, with cable clips running along the edge of the HDD cage to route SATA cables neatly.

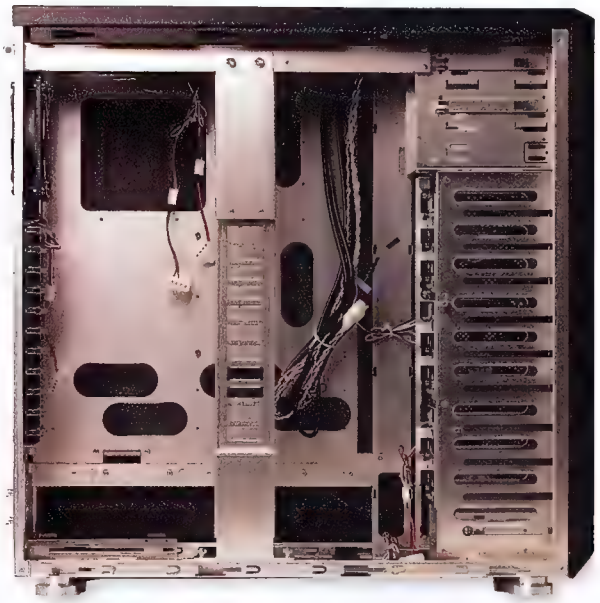
Rear expansion is abundant; there's eleven screw-less slots, which are quite fun to play with. You know a case is fancy when metal (not plastic!) latches on with a satisfying snap! No need to struggle with flimsy insecure mechanisms, or hunting for a suitable screwdriver. Cards as large as 390mm can be installed, so there's no concerns when looking to purchase massive powerhouses such as the HD6990.

Front panel ports are fairly standard. Two USB 3.0, a USB 2.0, eSATA and HD audio ports are situated at the top of the case. The front facia is easily removed to access the drive bays; just a simple tug on the edges will reveal the innards. At the rear we're greeted by two rubber grommets to allow water cooling tubing to pass through.

Three 120mm fans fitted with removable dust filters form the air intake, but are attached to the side panel rather than a traditional front side installation. A further three exhaust fans complete the package, although we wonder if this setup provides enough air pressure to prevent dust build-up from the various vents. Beneath the case is a removable dust filter for an installed PSU.

Speaking of the PSU, a nifty latch system makes it possible to install one without using screws! That being said, Lian-Li make it clear that it is advised that screws are used during transportation. Ahh well, can't be lazy all the time!

All things considered, this full-tower case really is a prime example of quality engineering, with great attention to detail. Even the screws come in an organised storage box! But this doesn't come cheap. $465 is definitely on the pricey side; most users would place this as a luxury item. VC



Build 96
Utterly satisfying.

Value 75
A quality box, for all the things.

Cooling 86
Plenty of fans and ventilation.

Features 94
Your cable routing fantasies, realised.

Overall:
Expensive, but oh so very tempting. Do want!

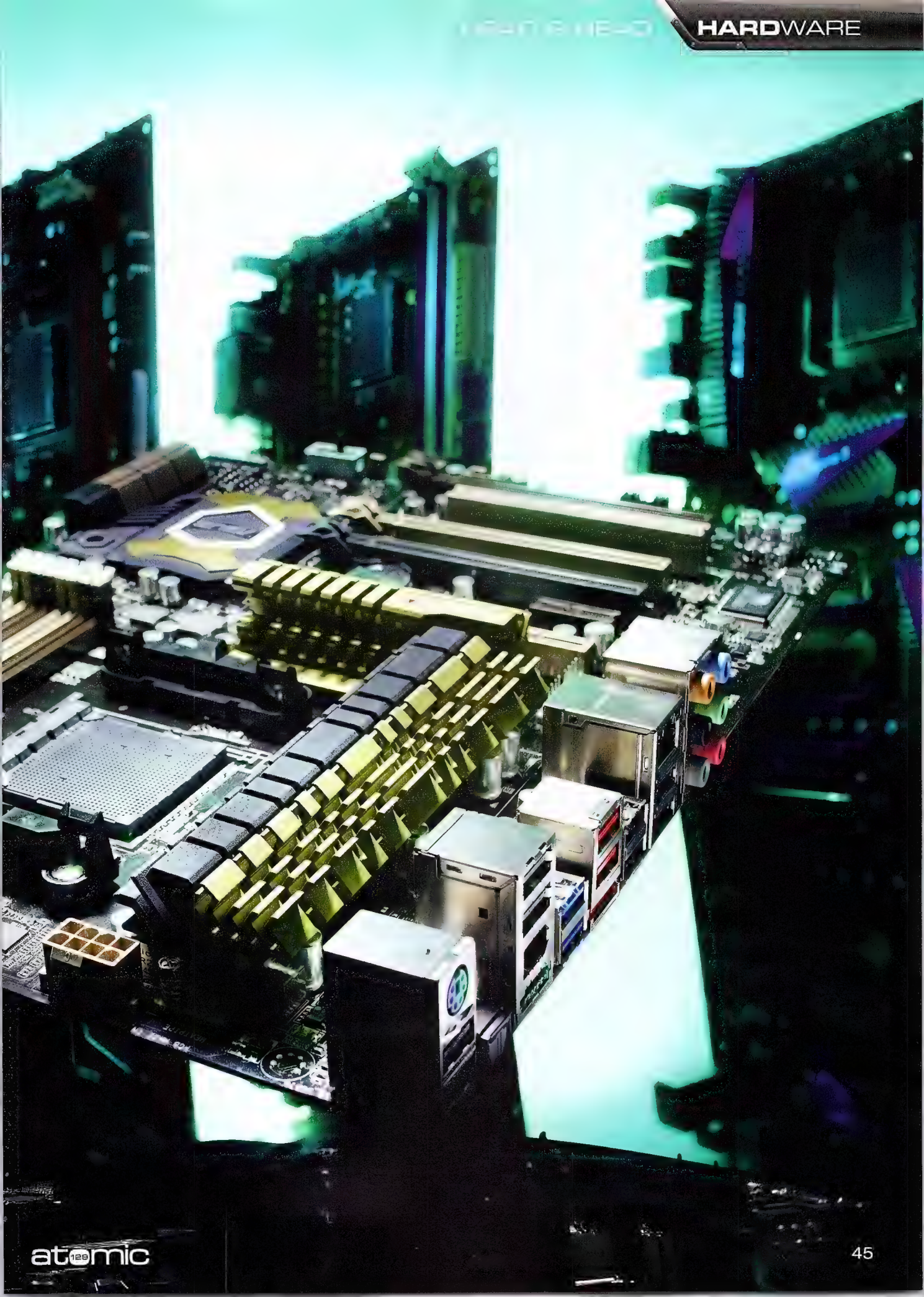
91%

LAYING THE FOUNDATIONS

Antony Leather looks at the latest round of AM3+ motherboards to find the best board for Bulldozer.

AMD's latest batch of Phenom II processors have proven to be worthy upgrades over their predecessors. They're competent overclockers and with the X6 1055T that can be had for less than $170, you can nab yourself six whole cores at an incredible price. AMD is also continuing its trend of backwards compatibility, as the new range of Socket AM3+ motherboards work with the current Socket AM3 processors. The AM3+ socket has pin holes slightly larger than preceding sockets, and also comes in black plastic instead of the earlier off-white.

These black sockets are also compatible with AMD's forthcoming Zambezi CPUs, which are based on the Bulldozer architecture. Zambezi is the most eagerly awaited AMD CPU since the original Phenom, and if you believe AMD's hype, it could turn the tables on Intel's Sandy Bridge. We've taken five of the newest Socket AM3+ motherboards, all of which are laden with features, and combined them with a 6-core Phenom II X6 1100T CPU in the hopes of predicting which of these boards will be best right now, and suitable for the future, too. If you're looking for a cutting-edge AMD motherboard, you've come to the right place.



HOW WE TESTED

Motherboards are tricky pieces of hardware to test properly. The performance of a motherboard is only one important factor; the interface standards it supports and the layout of its components are also crucial. Throw in the vagaries of BIOS/EFI design and how well each component is cooled, and it's no wonder that some motherboards struggle to overclock, while others are capable of amazing levels of performance. This is why we take motherboard design so seriously. After all, the motherboard is the foundation for your PC: choose the wrong one and it may hinder the performance of every other component in your system.

Before benchmarking the boards, we update the BIOS or EFI to the latest publicly available version to ensure we test the board in its best possible state. We aim to use publicly available updates to ensure that our findings are as representative of the product on sale as possible.

We then benchmark each motherboard at its BIOS defaults using our Media Benchmarks suite (see **http://tinyurl.com/cpcbench**), Arma II: Operation Arrowhead (at 1,920 x 1,080 with 4x AA and settings at very high). We also used the latest version of ATTO Disk Benchmark to test the speed of every SATA controller on the motherboard, using a transfer size of 1024KB. These tests tell us how fast the motherboard is out of the box.

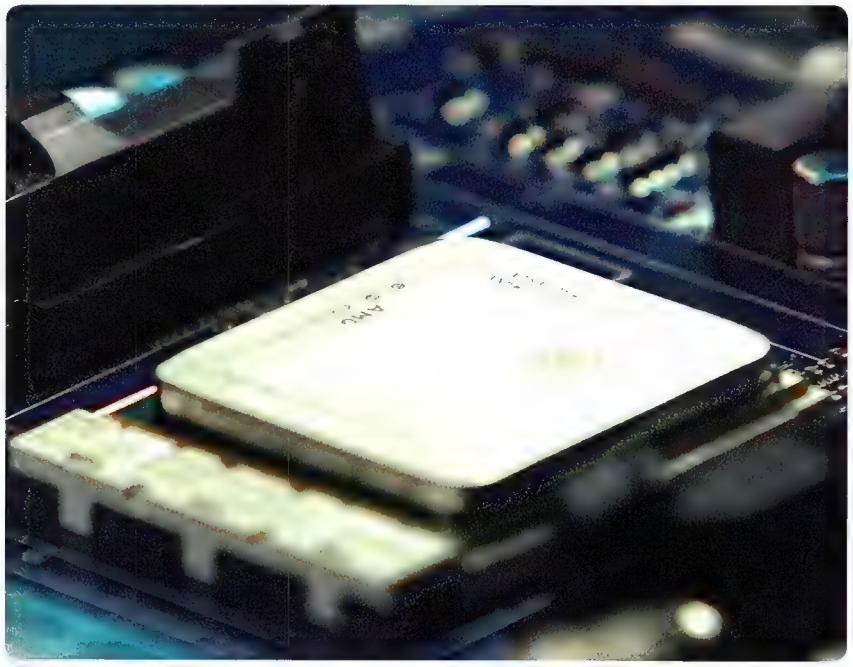
Once these tests are complete, we determine the maximum stable HTT frequency that each motherboard would support. To ensure that the motherboard, and not the CPU or RAM, was the limiting factor in this test, we dropped the CPU multiplier and RAM divider to the minimum allowable setting, and then proceeded to raise the HTT, adding voltages as necessary.

In order to check the motherboard stability when overclocked we leave them running the smallfft stress test of Prime95 (see **www.mersennes.org**) for a period of at least 15 minutes.

With the maximum HTT established, we overclock the CPU to its limit using the highest possible HTT. As not all motherboards are capable of maxing out our test CPU, this test often reveals significant performance differences between motherboards, which is why you'll find the benchmark results from this overclocking test alongside the stock-speed benchmark results. Our test kit comprises an AMD Phenom II X6 1100T CPU, a Titan Fenrir CPU cooler, 4GB of Corsair 1600MHz DDR3 memory, a 2TB Western Caviar Black hard disk and an Asus GeForce GTX 590 3GB graphics card using the GeForce 275.33 graphics driver in Windows 7 Home Premium 64-bit.

We also judge the features of each motherboard, such as how many SATA ports and fan headers were included, and how well laid out the PCB is. Additionally, we note whether the motherboard supports CrossFire and SLI.

Points are also awarded for how well the chipset, VRMs and Southbridge were cooled, how intuitive and user-friendly the BIOS/EFI is, and how well it recovered after being unsuccessfully overclocked. We then calculate the overall score for each motherboard by a weighted calculation of performance (stock speed and overclocked), features and value for money.

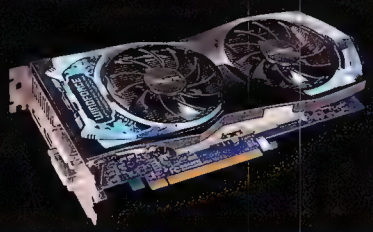


RADEON GRAPHICS AMD

supports up to 4 displays

GIGABYTE™

GIGABYTE WINDFORCE™ Super cooling solution



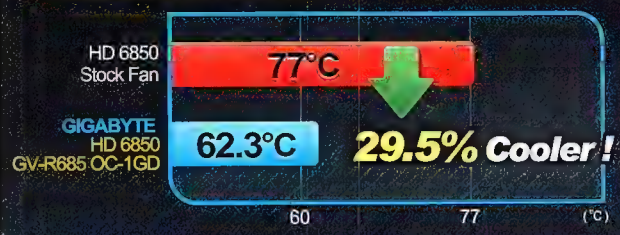
Ultra Durable VGA 2oz Copper PCB

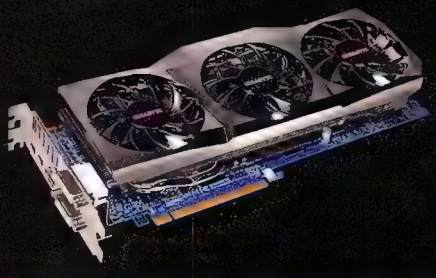
WINDFORCE ANTI-TURBULENCE COOLING

GIGABYTE WINDFORCE™ Series
GV-R685OC-1GD

- GIGABYTE WINDFORCE™ 2X Cooling Design
- GIGABYTE Ultra Durable VGA High Quality Components
- Extreme Overclock : 820 MHz (Std 775MHz)
- Pure Copper Heat Pipe X2

★ Thermal Comparison





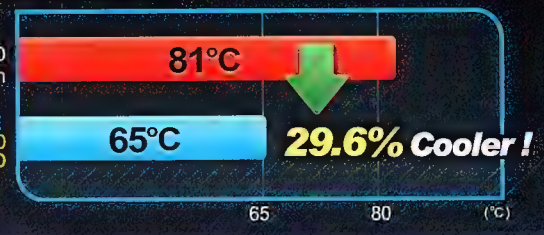
Ultra Durable VGA 2oz Copper PCB

WINDFORCE ANTI-TURBULENCE COOLING

GIGABYTE WINDFORCE™ Series
GV-R687OC-1GD

- GIGABYTE WINDFORCE™ 3X Cooling Design
- GIGABYTE Ultra Durable VGA High Quality Components
- OC Version : 915 MHz (std 900 MHz)
- Pure Copper Heat Pipe X3

★ Thermal Comparison



AMD CrossFireX TECHNOLOGY

AMD Catalyst SOFTWARE

AMD Accelerated Parallel Processing TECHNOLOGY

SUPPORTS Microsoft® DirectX® 11

www.gigabyte.com.au

ASRock 890FX Deluxe 5

So much more deluxe than the Deluxe 4.

Street Price $226 **Manufacturer** www.asrock.com
Specifications Socket AM3+; AMD 890FX chipset; ATX form factor; 3 PCIe x16 (2 x16, 1 x4 electrically); 1 PCIe x1; 2 PCI; 8 SATA3; 2 USB3; DDR3-1866

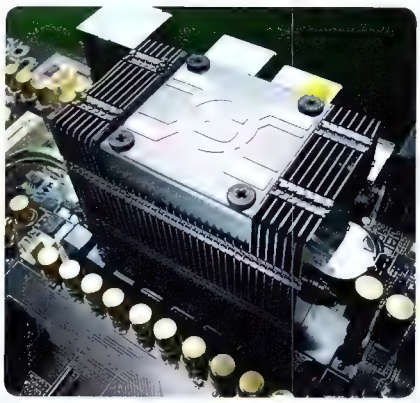
With towering blue and white heatsinks, the Deluxe 5 is ASRock's latest motherboard designed for AMD CPUs. Despite this, the Deluxe 5 isn't equipped with AMD's new 990FX chipset, which AMD says is part of its official support list for its forthcoming Zambezi CPUs.

ASRock, however, claims that the Deluxe 5 will support the new CPUs and has fitted a black CPU socket – the colour identifying motherboards that support Zambezi CPUs. Only time will tell if this proves correct. The dark brown PCB is well laid out, with the SB850 Southbridge's six SATA 6Gbps ports aligned parallel with the motherboard. There are two further SATA 6Gbps ports by way of a Marvell SE9120 controller, although these are located at the rear of the PCB, near the I/O panel. A 40mm fan is included, which can be installed on the large VRM heatsink to improve cooling. It's very quiet, and can shift a noticeable amount of air through the heatsink and over the PCB, so it's worth using if you're performing a heavy overvolt or your CPU cooler doesn't blow much air over the VRMs.

All the power sockets are located at the edge of the PCB, as are a majority of the Deluxe's six fan headers. The latter, however, are all located in the top half of the PCB, which isn't ideal if you want to power fans in the bottom of your case. One feature we do like is the addition of a second CPU fan header – something that both ASUS motherboards we look at also feature. The pair of headers means that you can easily use a CPU cooler with two fans; such coolers are increasingly common with enthusiasts, and tend to be very useful for heavy CPU overclocks. Overclocking the board is easy too, with power and reset buttons, and a POST error code readout located on the bottom of the motherboard; a CMOS clear switch is positioned on the I/O panel.

Like other ASRock boards, the Deluxe 5 includes a USB 3 breakout box – this is a 3.5in drive bay unit sporting two USB 3 ports, which makes use of the single USB 3 header on the motherboard. This also gives extra flexibility to older cases that do not yet support the standard. There are two further USB 3 ports on the rear I/O panel, along with eSATA 3Gbps, FireWire ports and six USB 2 ports. There are three 16x PCI-E slots, which support 3-way CrossFireX, although only the top two are able to run with 16 PCI-E lanes – the third runs with only four PCI-E lanes. The Deluxe is also the only motherboard not to support SLI.

ASRock, however, claims that the Deluxe 5 will support the new CPUs and has fitted a black socket – the colour identifying Zambezi...

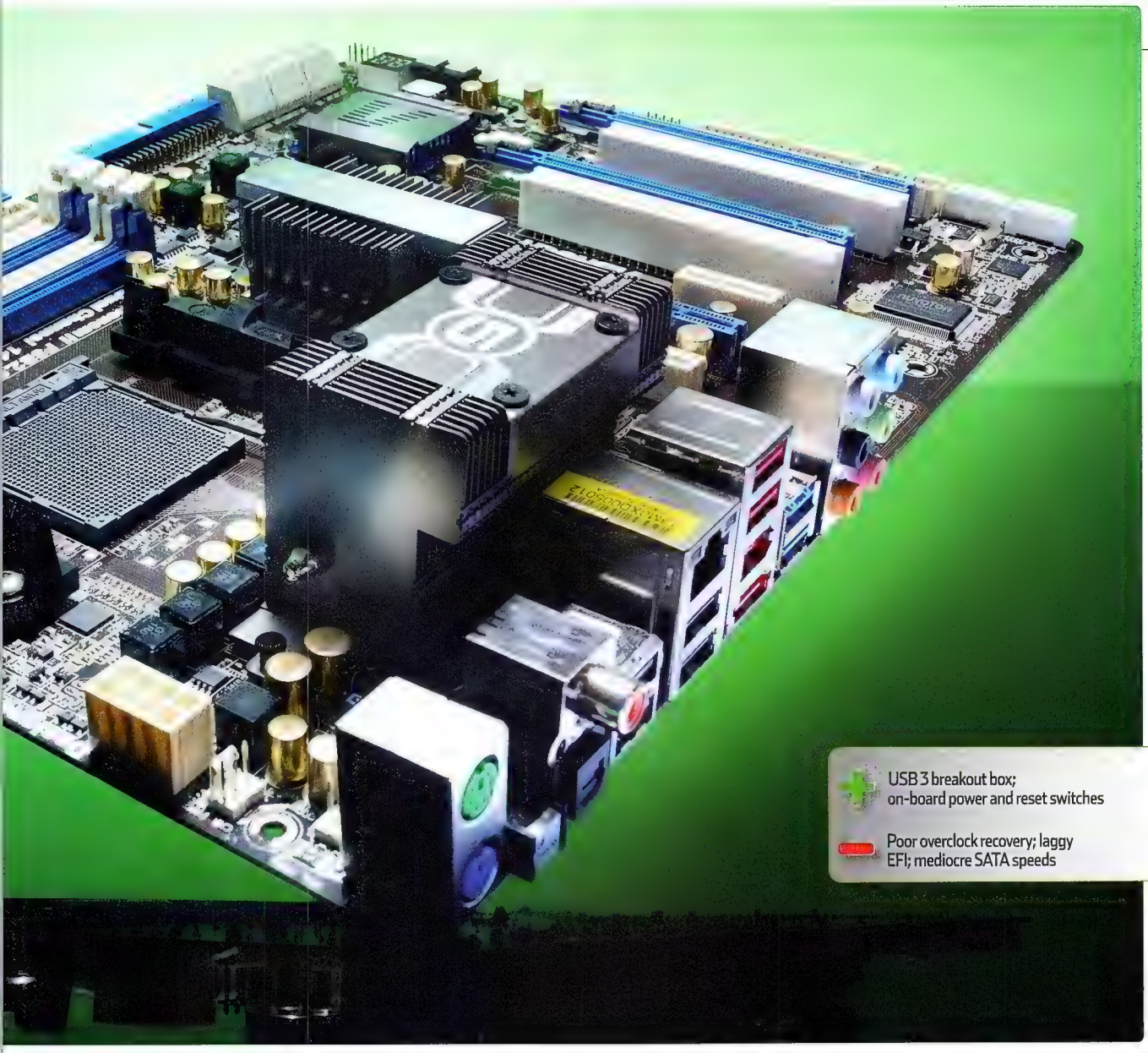


There was little to separate most of the motherboards in many of our benchmarks. The Deluxe returned fairly average results, although its Gimp image editing score of 1,089 was eight points clear of the rest of the competition, and 50 points faster than the considerably more expensive GIGABYTE 990FXA-UD7 (see p72). Its HandBrake H.264 video encoding score of 2,032 and multi-tasking test score of 1,021 are the second slowest on test though. Overall, the Deluxe5 scored 1,381, which is second from bottom, although only by 17 points.

The Deluxe struggled somewhat in Arma II, managing a minimum frame rate of only 56fps – 8fps slower than the fastest motherboard on test, the ASUS Crosshair V. The Deluxe's SATA performance was mediocre too – the SB850 chipset mustered a read speed of 381MB/sec and a write speed of 355MB/sec. This is much slower than the ASUS Sabertooth 990FX, which pushed our OCZ Vertex 3 SSD to its limit, with a read speed of 547MB/sec and a write speed of 474MB/sec. The Marvell SE9120 controller wasn't much better, recording a faster read speed of 403MB/sec, but a slower write speed of 211MB/sec.

Unusually for an 890FX-based motherboard, the Deluxe 5 sports an EFI, but it was a very mixed bag. It was relatively well laid out, but it proved to be laggy and unresponsive. Even more annoying was the fact that, while you're able to see the CPU frequency change after you've adjusted the CPU multiplier, the display for this is at the opposite end of the page – we were constantly scrolling up and down. This was particularly irritating due to the lag, and there weren't many options from which to choose either. The EFI was also very poor at recovering from ambitious overclocks, often requiring five or more reboots before we regained control.

In the end, we managed to push the HTT to a healthy maximum of 340MHz by raising the CPU NB voltage to 1.35V, the NB to 1.335V, the SB



+ USB 3 breakout box; on-board power and reset switches

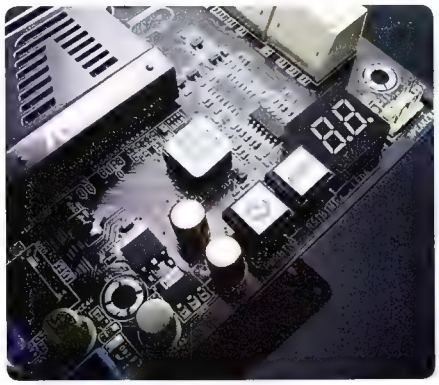
- Poor overclock recovery; laggy EFI; mediocre SATA speeds

to 1.3V and finally the HTT to 1.3V. Unfortunately, we had to drop the HTT to 295MHz when overclocking the CPU. Combined with a CPU multiplier of 14x, the CPU operated at 4.13GHz, which required a vcore of 1.5V.

This saw an improvement in our benchmarks, with the overall Media Benchmarks score gaining 238 points to total 1,619, and Arma II seeing a 10fps rise to a minimum frame rate of 66fps.

While the 890FX Deluxe is the cheapest motherboard by a scrape, it has a few significant drawbacks. It was a nightmare to overclock, taking far longer than any other motherboard to reach its limits, and regularly failing to recover if we pushed it a little too far. The EFI is a poor effort compared with competing offerings, particularly as it's so laggy – overclocking this board was a chore rather than a pleasure. Due to the poor EFI, the board was marked down heavily on features, even though it includes plenty of useful bits and bobs on the PCB.

Its saving grace is that it has on-board power and reset switches, which meant that endlessly rebooting the PC after failed overclocks was at least easy, if very time-consuming. We can forgive the inclusion of the previous-generation 890FX chipset, as ASRock says that this board will be compatible with the forthcoming Zambezi CPUs – even AMD says the updated 990FX chipset doesn't add anything. However, there are better examples of Socket AM3+ motherboards out there for not a lot more cash.



Overall

An okay choice if you love ASRock, but there are certainly better buys.

70%

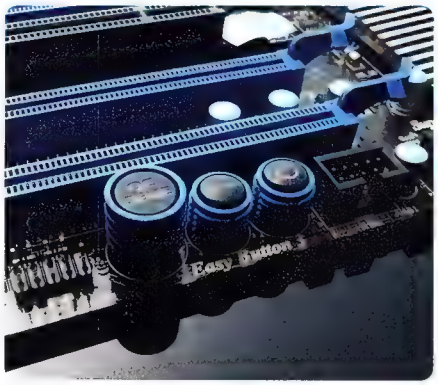
MSI 990FXA-GD80

'Military Class' act leaves little to the imagination.

Street Price $230 Manufacturer www.msi.com
Specifications Socket AM3+; AMD 990FX chipset; ATX form factor; 4 PCIe x16 (2 x16, 1 x8, 1 x4 electrically); 2 PCIe x1; 1 PCI; 6 SATA3; 2 USB3; DDR3-2133

The 990FXA-GD80, as its name suggests, is equipped with AMD's latest 990FX chipset; combined with a black socket, this means that it's compatible with AMD's forthcoming Zambezi CPUs. The area around the CPU socket is particularly clean, and should allow even the largest of coolers to be used without any issues. As is the case with a majority of Socket AM3+ motherboards, the first two DIMM sockets are a little too close to the CPU socket for clearance underneath larger heatsinks – tall memory modules should be avoided with this motherboard.

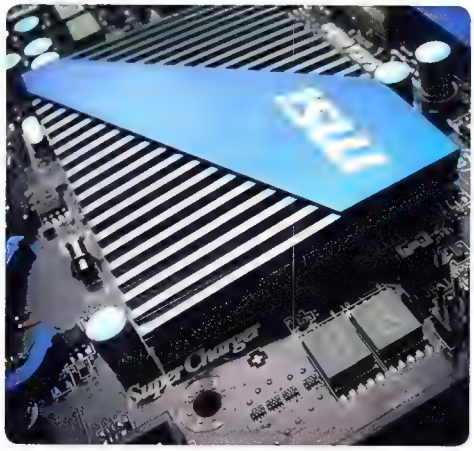
The rest of the PCB is generally well laid-out – the only exception is the 8-pin EPS12V connector, which MSI has awkwardly placed a good inch from the edge of the PCB, with a fan header right next to it for good measure. Apart from this oddity, the fact that the six SATA 6Gbps ports are all mounted parallel to the PCB and that the 24-pin ATX connector is located at the edge of the board means that cable routeing shouldn't be too haphazard.



As well as on-board power and reset buttons, which can be useful for out-of-the-case testing and overclocking, the GD80 is equipped with MSI's OC Genie button, which promises super-quick overclocking. However, both this and the included MSI Control Centre overclocking program proved to be a little quirky and limited (the program could only raise the HTT up to a paltry 250MHz for starters); we kept our focus on the EFI.

A POST error code readout adds to the growing list of useful overclocking tools on the GD80, and there are a healthy five fan headers on the PCB. The GD80's six SATA 6Gbps ports are all provided by the SB950 Southbridge, while the I/O panel has two hybrid 3Gbps eSATA/USB ports using a JMicron JMB362 controller. Two USB 3 ports and a USB 3 header located on the PCB are provided via a NEC D720200 chip. The GD80 sports MSI's currently favoured colour scheme of a dark brown PCB with blue and silver details; the heatsinks look especially sleek.

The rest of the PCB is generally well laid-out – the only exception is the 8-pin EPS12V connector, which MSI has awkwardly placed...



There are four 16x PCI-E slots, which support SLI and CrossFireX using up to three graphics cards. The three primary 16x slots are well spaced. While the lane configuration is the standard affair: the first two slots offer 16 lanes of bandwidth, but if you use the third as well, the secondary and tertiary slots each provide eight lanes of bandwidth. The fourth slot offers only four PCI-E lanes, while there are also two 1x PCI-E slots and a PCI slot.

At stock speeds the GD80 was fairly inconsistent. It recorded some of the slowest results in the Gimp image editing and HandBrake H.264 video encoding tests, but its score of 1,061 in the multi-tasking test was second only to the Sabertooth 990FX, both of which were noticeably faster than the rest of the competition. This was unable to bring its overall score back in line, however, and the GD80's overall score was the slowest board tested, though only by two points.

Its minimum frame rate in Arma II of 61fps was third only to the ASUS motherboards, which shared the gaming honours. Despite sporting the same SB950 Southbridge as the two ASUS motherboards, the GD80's SATA performance was way off pace, managing read and write speeds of just 288MB/sec and 326MB/sec respectively. We can only assume that ASUS has been working hard behind the scenes with the new chipsets, as all other manufacturers' boards were significantly slower.

Easy overclocking; loads of features

Not great for overclocking

The GD80 is equipped with an EFI, which is far more capable and flexible than any of the other overclocking features it sports, such as MSI's Control Center software. Unfortunately, like all the other boards, the GD80 struggled to recover from failed overclocks, even those that were just a hair too far. Recovering the board from failed overclocks wasn't quite as arduous as it was with the ASRock 890FX Deluxe5, though.

Sadly, we couldn't push the GD80 beyond a maximum HTT of 250MHz. The voltages were quite limited in places too, with only 1.3V on offer for the NB. Even maxing this out, and pushing other voltages well over 1.3V, failed to yield results. The HTT overclock was considerably poorer than the second lowest 320MHz maximum HTT from the UD7.

However, we were able to use most of this HTT when overclocking the CPU, and managed a CPU multiplier of 17x for an overall overclock of 4.2GHz (with an HTT of 247MHz). This was the highest overall overclock of all the boards on test.

We achieved the overclock using a CPU voltage of 1.5V, along with a 1.3V NB, 1.321V SB, 1.348 CPU NB and a 1.335V HT Link. This saw the overall benchmark score leapfrog to 1,581 but this was still the second slowest on test. The overclocked GD80 managed a minimum frame rate of 67fps in Arma II, though, the third fastest result.

The 990FXA-GD80 was limited in the overclocking department but compensated with a high CPU frequency. The resulting speed wasn't amazing compared with the competition, but it was enough to secure a solid position. The most disappointing aspect of the GD80 was its SATA performance though – it recorded the slowest read and write speeds on test from the SB950 Southbridge. This can't be overlooked if you have a SATA 6Gbps SSD that can take advantage of the speeds that the Sabertooth and Crosshair V have to offer. With average overall speed results and a questionable EFI, we'd definitely spend another $15 on the Sabertooth 990FX instead.

Overall

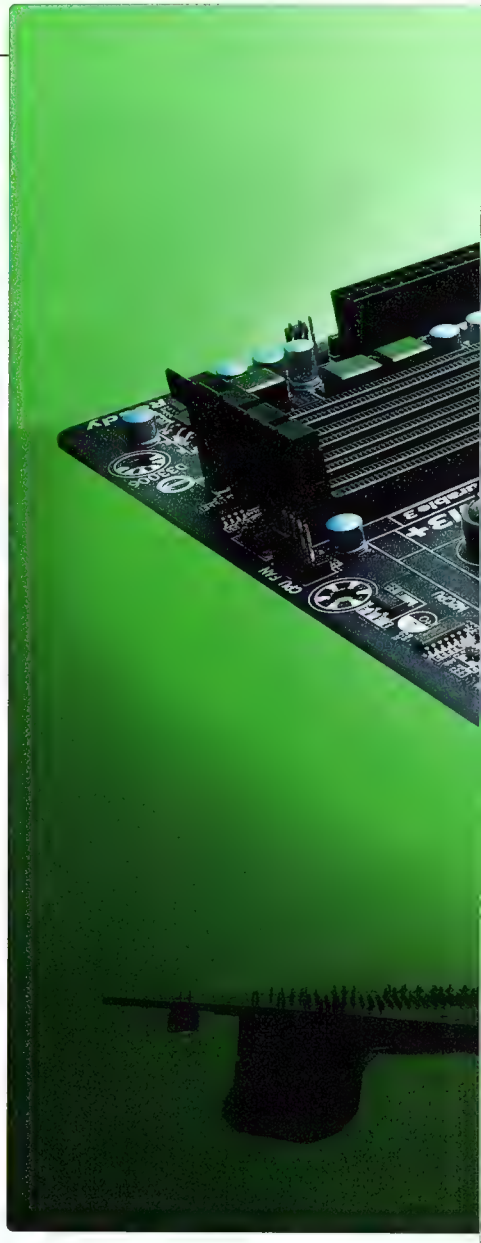
A mixed bag of difficulties makes a second-place contender.

75%

GIGABYTE 990FXA-UD7

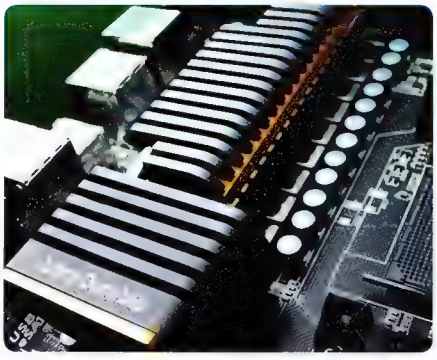
Black is the new black.

Street Price $265 **Manufacturer** www.gigabyte.com
Specifications Socket AM3+; AMD 990FX chipset; ATX form factor; 6 PCIe x16 (2 x16, 2 x8, 2 x4 electrically); 1 PCI; 8 SATA3; 2 USB3; DDR3-2000



GIGABYTE's UD7 range of motherboards has graced all the popular CPU sockets in recent years. We've come to expect an abundance of features, solid overclocking performance and a price tag to match that desirability. Unfortunately, the UD7's principal competitors have often been cheaper models in GIGABYTE's own ranges, such as the UD3 or UD2 boards, which often overclock just as competently.

The 990FXA-UD7 is certainly pricey at a little under $270, but the PCB is bristling with all manner of items. At 263mm wide, the PCB is a good 20mm larger than the other motherboards on test, but the board looks as though it needs extra height as well as girth. This is for two reasons: the top 16x PCI-E slot is so close to the CPU socket that our GeForce GTX 590 3GB graphics card nearly blocked the fan on our CPU cooler. Additionally, the 8-pin EPS12V connector has had to be migrated a good inch away from the edge of the PCB, so it isn't quite as well placed as those of all the other motherboards on test. It does still fit within the ATX specification.



> The top 16x PCI-E slot is so close to the CPU socket that our GeForce GTX 590 graphics card nearly blocked the fan...

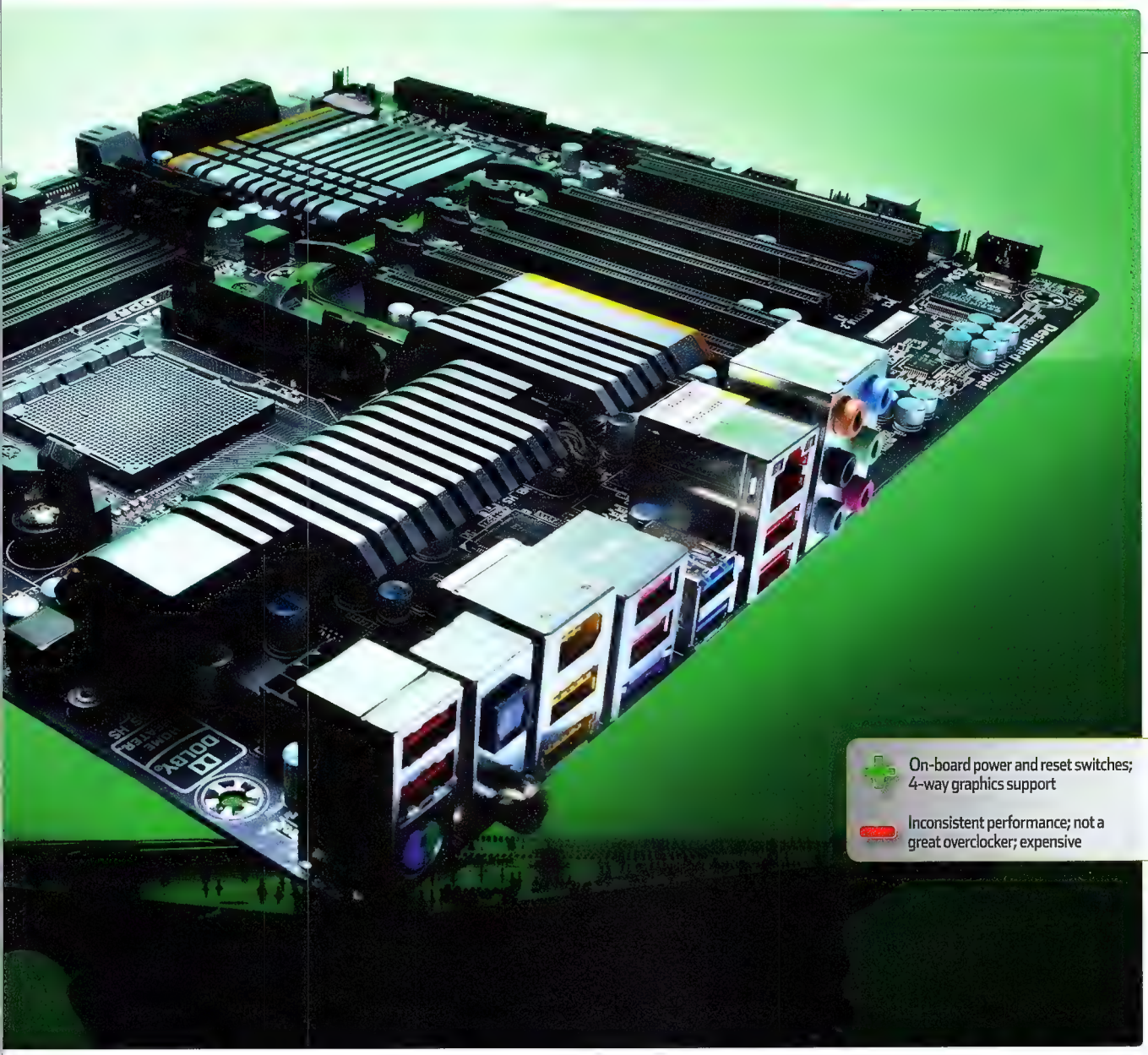
The on-board USB headers are a little awkward to reach as well – they're located on the bottom-left corner of the PCB, which is about as far as possible from your case's front drive bays. All other aspects of the PCB are well thought out though. The 24-pin ATX connector sits very close to the edge of the PCB, and all eight of the UD7's SATA 6Gbps ports are mounted parallel to the PCB for easy cable routeing. There are on-board power and reset switches, as well as a clear CMOS button, installed adjacent to the DIMM slots. This is excellent, as you can still easily use these buttons even when the motherboard is installed in a case. The POST error code readout is located just south of the SATA ports. However, the UD7 is equipped with only four fan headers – which may not be enough for an enthusiast machine.

The UD7 is the only motherboard on test to have all of its VRM, chipset and Southbridge heatsinks linked by heatpipes, which should help to even out the heat load. This can be useful, as it allows a hot component to offload heat onto a cooler heatsink. A huge section of the PCB is taken up by a total of six 16x PCI-E slots, along with a single PCI slot, and the UD7 supports up to 3-way SLI and four-card CrossFireX. GIGABYTE include all the connectors necessary for any multi-GPU setup you care to use.

It took a while to figure out how the PCI-E lanes are configured on the UD7, but it appears that dual graphics card setups will run at full speed. The other four slots are made up of two 8x PCI-E slots and two 4x slots. The former share bandwidth with the primary and secondary slots, so installing third and fourth graphics cards will throttle the first and second 16x PCI-E slots to eight lanes of bandwidth; in effect giving four slots by eight lanes. Strangely, the UD7 has only two USB 3 ports on the I/O panel – two fewer than the Crosshair V and the ASRock 890FX Deluxe 5. However, a further two can be added using the on-board USB 3 header.

At stock speeds the UD7 proved to be quite inconsistent. It recorded the highest scores in the Gimp image editing test and the HandBrake H.264 video encoding test by a considerable margin. However, its score of 973 in the multi-tasking test was very poor. Even then, the UD7 managed second place overall with a score of 1,392 – only the Sabertooth 990FX was faster, with a score of 1,398.

The UD7 also produced a disappointing performance in Arma II, with a minimum frame rate of 58fps – 6fps lower than the Crosshair V. SATA performance was rather poor too – it managed a read speed of 372MB/sec, with the write speed slightly higher at 400MB/sec via the SB950 Southbridge. The Marvell 88SE9172



On-board power and reset switches; 4-way graphics support

Inconsistent performance; not a great overclocker; expensive

controller fared even worse, only managing read and write speeds of 276MB/sec and 201MB/sec respectively.

The UD7 isn't equipped with an EFI, so instead we headed into the traditional BIOS to perform some tweaking there. While it didn't have the pizzazz of the ASUS boards' EFI, at least the UD7's BIOS was lag-free and well laid out.

Sadly, we were only able to push the HTT speed to 320MHz at most, which required an HT link voltage of 1.325V, a NB voltage of 1.3V, and a CPU NB VID of 1.35V – strangely, there was no Southbridge voltage option. We couldn't use this maximum HTT when we raised the CPU multiplier either, an indication that the UD7 isn't a great overclocker, especially for very heavy overclocks.

We finally settled on a 305MHz HTT using a CPU multiplier of 13x. Despite our best efforts, the UD7 didn't want to play ball with the CPU clocked above 4GHz. The UD7 wasn't able to recover from most failed overclocks, either.

Not surprisingly, the low HTT and CPU frequency resulted in the lowest overclocked Media Benchmarks scores, although its overall score of 1,556 was only 76 points short of the Sabertooth 990FX, which came out on top. The UD7 was unable to shake off its poor Arma II performance, though, and could only muster a minimum frame rate of 64fps. This is an increase of 6fps, a result that was matched by the Crosshair V at stock speed.

The UD7 is a monster in some ways and a weakling in others. It has a packed PCB, which sports useful features such as power and reset switches, and it's also able to cater for the craziest of SLI or CrossFireX setups. While it uses a BIOS rather than an EFI, it was more pleasant to overclock than the ASRock 890FX Deluxe 5 or the MSI 990FXA-GD80.

However, it isn't a great overclocker. The Sabertooth 990FX managed a higher maximum HTT and CPU frequency yet costs $20 less. If you must have a 4-way graphics card setup, the 990FXA-UD7 is the only real option in this head2head; otherwise, the Sabertooth 990FX and Crosshair V Formula are better choices.

Overall

Poor overclocking performance outweighed with good cooling.

78%

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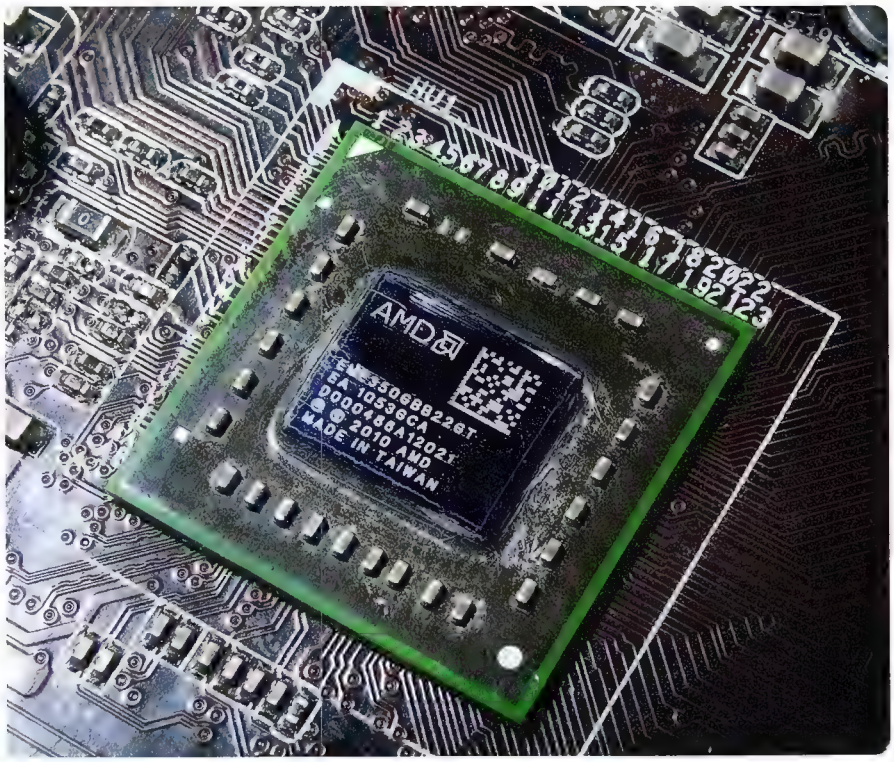
What will AMD do in 2011?

Antony Leather and **Clive Webster** drill into AMD's future architectures.

This month marks a significant divergence in AMD CPUs, as AMD has launched its 'Llano' APU (Accelerated Processing Unit) and announced a new range of high-performance 'Zambezi' CPUs that will take over from Phenom II. Let's deal with Llano first, as this APU is aimed at laptops and entry-level desktops, and uses a completely new CPU socket called FM1. As a mainstream chip, Llano still uses the K10 processing architecture of the Phenom II series, albeit shrunk from 45nm to 32nm, with some IPC improvements and Level 2 cache upgrades.

Socket FM1 'Llano' processors aren't compatible with Socket AM3 or Socket AM3+ motherboards, and we'll have to wait until next month before we get our hands on FM1-based motherboards. The new socket is necessary because Llano is an APU – the single silicon die fuses CPU, PCI-E controller and GPU – and therefore needs more (or at least different) connections to the motherboard than the CPUs AMD has previously made.

This fact makes the new Socket AM3+ processor socket featured in this head2head an interesting option, as it implies that the forthcoming Zambezi CPU design doesn't have an integrated GPU; it isn't an APU. Instead it's a CPU designed for maximum performance, and as such, AMD doesn't force you to pay for an integrated GPU that you probably won't use (as you do if you buy a Sandy Bridge CPU and a P67 motherboard). Zambezi CPUs will be based on the Bulldozer architecture, and will bear the legendary FX nomenclature to become the FX-series of CPUs. With LGA2011's arrival just round the corner, a new architecture from AMD is very welcome indeed.



AMD's E-350 APU was soldered into Fusion mini-ITX motherboards. The new Lynx CPUs, based on the Llano architecture, won't be integrated and have a unique processor socket called Socket FM1.

Meet the new CPUs

Bulldozer is perhaps the most anticipated of AMD's new architectures. While the Bobcat architecture of the E-350 was great for netbooks and low-power PCs, Bulldozer is AMD's first genuinely new high-performance architecture since 2003's Athlon 64 design.

There are no official performance numbers for Bulldozer CPUs yet, but highlights of the architecture look promising. Bulldozer will most notably feature dual-issue logic, allowing each CPU core to process two threads simultaneously.

AMD says that more of the CPU core is replicated to allow these concurrent threads to be processed much quicker (with less stalling when the two threads need to use a certain sub-unit) than with Intel's Hyper-Threading. This has led to some confusion as to what counts as a 'core', but we hear that Zambezi CPUs will have up to eight cores, which we assume means 16 threads.

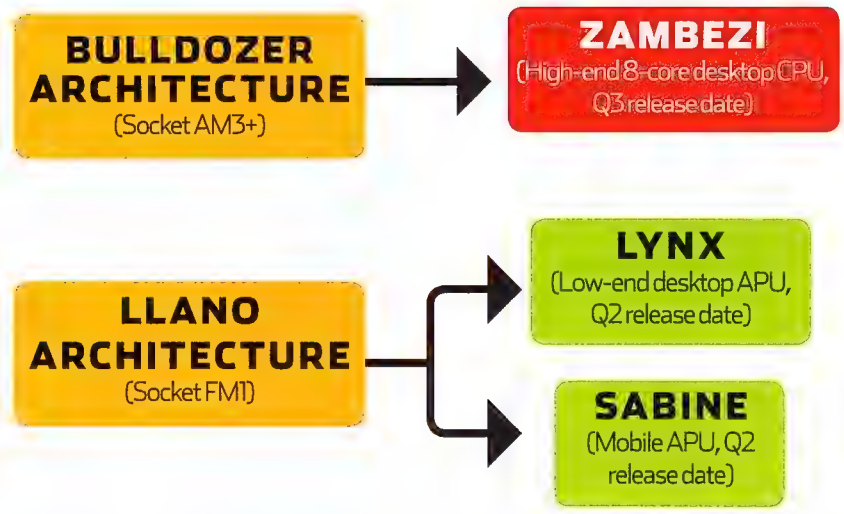
AMD is surprisingly bullish about Bulldozer being able to compete with Intel's Sandy Bridge lineup. As usual, though, leaked benchmarks are notoriously inaccurate, so we suggest waiting until we get one of the new CPUs to see if it should be at the heart of your next PC. You should regard a Socket AM3+ motherboard as an upgrade to a current PC, based on current Socket AM3 processors, or for a scratch build with a Socket AM3 CPU. No AM3+ boards have 100% guaranteed support for a CPU architecture that hasn't been released, and we still don't know if Zambezi is brilliant. However, rumours from Taiwan indicate that Zambezi CPUs will be delayed until September; they had originally been scheduled to launch with the

motherboards we're testing this month.

AMD's Llano APUs are intended for low-end and mainstream desktop PCs, and mainstream laptops. APUs for the latter sport the codename Sabine, while their desktop counterparts are known as Lynx. They'll all be branded as A-series processors.

There are seven models of Llano-based A-series APU at launch, all for laptops, and which slot into three types. A4 APUs will be dual-core and have basic Radeon GPUs with 260 stream processors and only 2MB of Level 2 cache. A6 and A8 APUs will both be quad-core processors with 4MB of Level 2 cache; A6 processors will be twinned with a 320-stream processor GPU, while A8 processors will receive the full 400-stream processor GPU. TDPs of these vary between 35-45W and the Turbo Core frequencies are healthy too. Despite the aging K10 CPU architecture, AMD still says that the range can live with Intel's Sandy Bridge CPUs, although it's pitching quad-core A6 laptops against those sporting an Intel dual-core Core i3 CPU.

Two new architectures, three new processors



The 990FX chipset

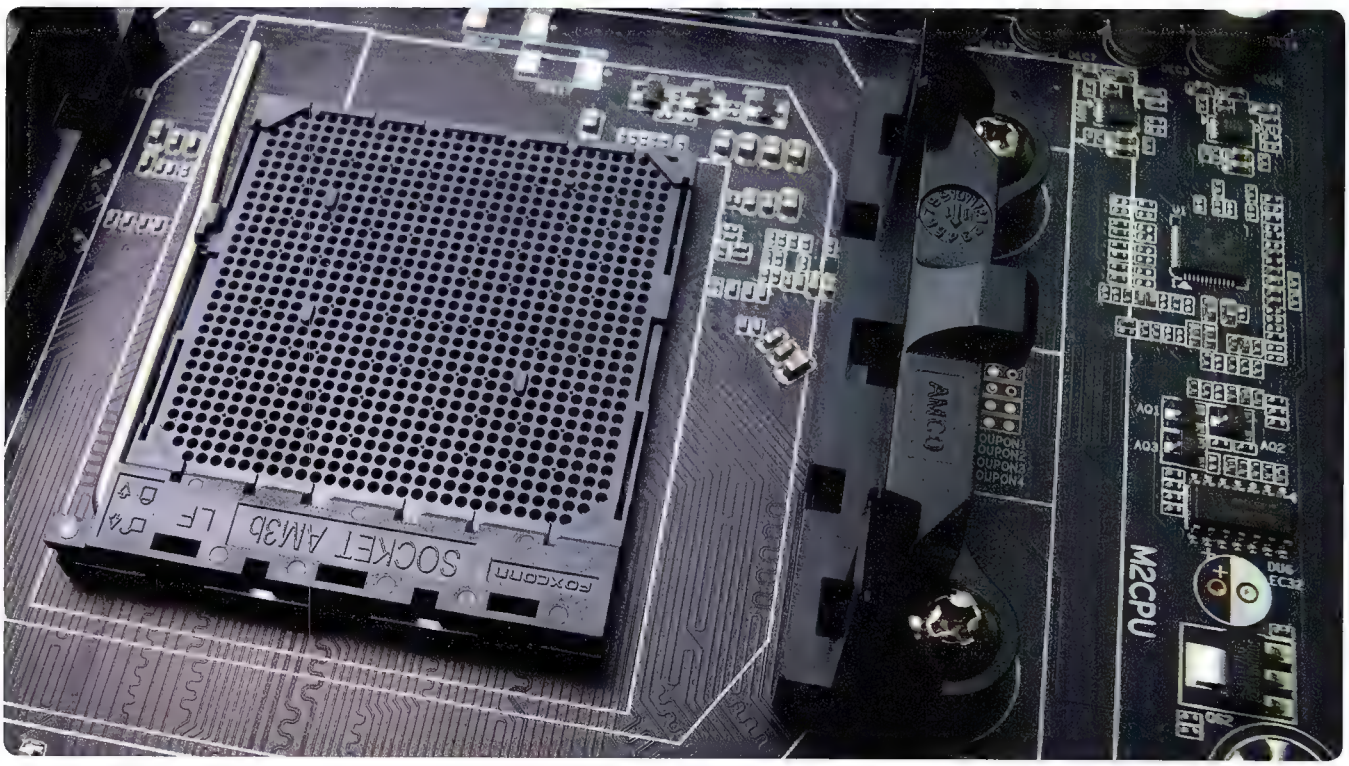
We've only recently managed to confirm that AMD's new 990FX chipset, despite our initial predictions, is identical in all but name to its predecessor, the 890FX. We'd thought initially that Bulldozer would require a new chipset as it's so new an architecture. However, it seems that there has been little reason for AMD to update the chipset's design, not even with a smaller manufacturing process.

AMD told us "not to downplay the excellent feature set this chipset has, but there aren't any new features with the 900-series chipset to document ... The AM3+ socket change and the 900-series chipset model numbers are intended to clearly delineate platform support for upcoming AM3+ packaged processors based on the Bulldozer architecture."

This makes us wonder about compatibility between Socket AM3 and Socket AM3+ hardware. While Socket AM3 CPUs are compatible with Socket AM3+ motherboards, Socket AM3+ processors aren't compatible with Socket AM3 motherboards. This raises questions about compatibility with motherboards sporting AM3+ sockets and older 8-series chipsets.

Backwards compatibility

Rumours and hype surrounding AMD's Bulldozer architecture also include news that Socket AM3+ CPUs would work on older motherboards equipped with 8-series chipsets. These rumours seemed to be confirmed recently when leading motherboard manufacturers announced a new range of motherboards that claim support for the new Socket AM3+ socket, but use current-generation 8-series chipsets.



Motherboards that are advertised as being compatible with Socket AM3+ are equipped with a black CPU socket, and should work with Zambezi CPUs.

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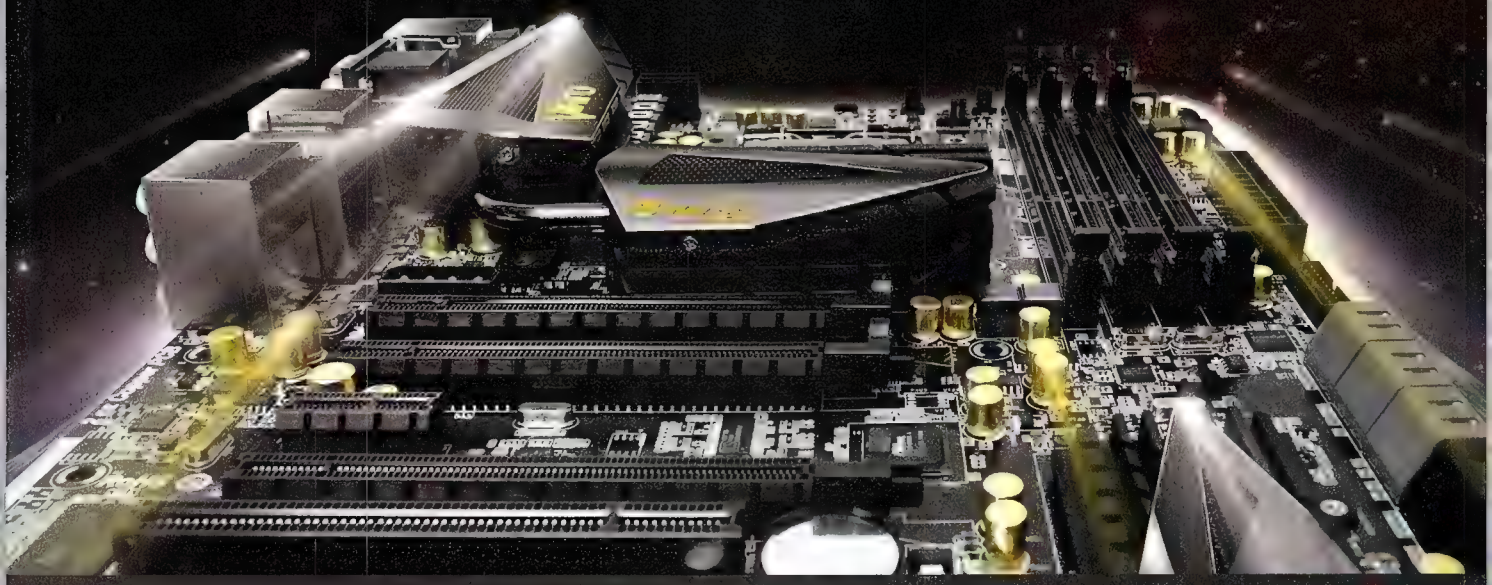

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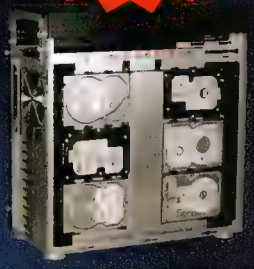

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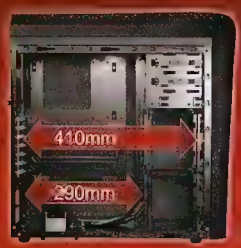

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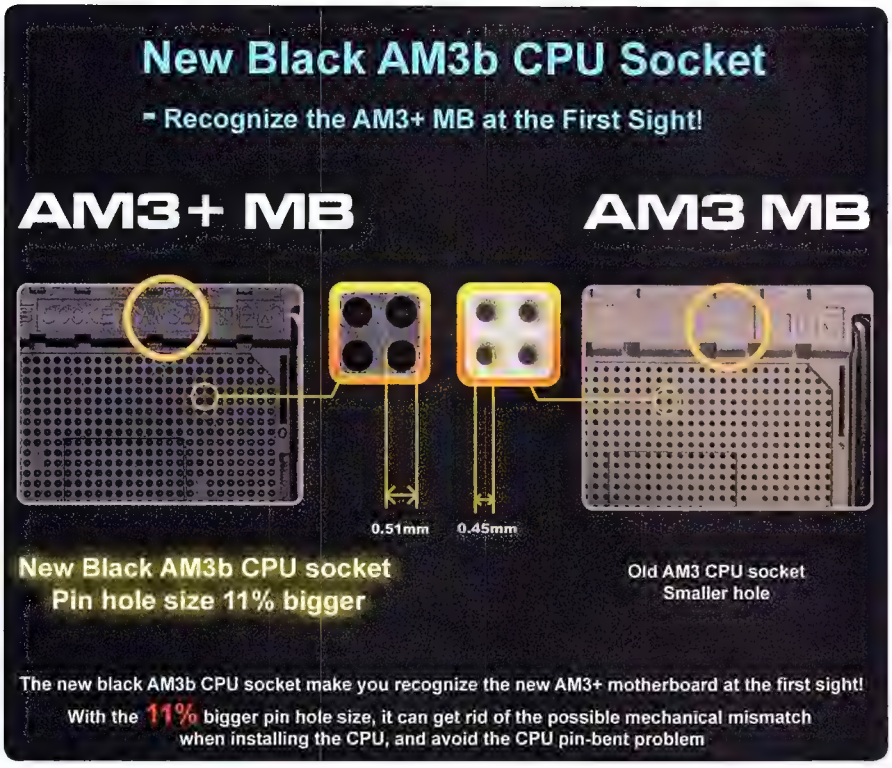


ASRock released a guide to AM3+ motherboards in April, in which it highlighted the differences between standard Socket AM3 CPU sockets and the new black sockets, which will support Socket AM3+ CPUs.

Since then, AMD has taken the stance that it won't be officially supporting the use of Socket AM3+ CPUs with anything other than a Socket AM3+ motherboard equipped with a certified 9-series chipset.

In a way, this statement makes things quite difficult, as it isn't clear whether a motherboard with an 8-series chipset (whether or not it has a black Socket AM3+ CPU socket) will support the new FX range of Zambezi CPUs. Whether AMD allowed motherboard makers to pair Socket AM3+ sockets and 8-series chipsets, or was powerless to prevent it isn't clear, but AMD has passed the buck to these companies to sort out any potential compatibility issues.

There are a couple of obvious reasons for this, as AMD clearly wants to sell more of its new 9-series chipsets, and it can also cut any R&D work it may otherwise have had to conduct to make Bulldozer CPUs work with previous-generation chipsets and motherboards. What we can clearly say is that you if you're buying a Socket AM3+ motherboard with the hope that the FX range of CPUs will be great (we stress again, we have no information either way that this will be the case), then buy one with a 9-series chipset.

Manufacturer opinion

AMD's stance on compatibility with anything other than a Socket AM3+ motherboard and a 9-series chipset flies in the face of what motherboard manufacturers have been saying for the past couple of months. Indeed, ASUS is even claiming compatibility not just with certain 8-series chipsets but with the 760G chipset too, albeit on forthcoming Socket AM3+ motherboards.

AMD clearly wants to sell more of its new 9-series chipsets, and it can also cut any R&D work it may otherwise have had to conduct...

To try to shed some light on the issues, we spoke to ASUS, MSI and GIGABYTE to get their opinions on what we can expect in the way of backwards compatibility. ASRock has already voiced its concerns, stating possible power issues which could make FX-series CPUs unstable or lack certain features when paired with a Socket AM3 motherboard.

ASRock has released a list of current Socket AM3+ compatible motherboards sporting the new black socket, and highlighted certain issues that might affect stability if an AM3+ CPU is used with an AM3 motherboard. ASUS has voiced similar concerns, but more interestingly, has found that a BIOS update is all that's required to allow a select range of Socket AM3 motherboards to work with Zambezi CPUs. These include specific boards sporting the 890FX and 890GX chipsets. This is great news for some motherboard owners, but make sure you check online.

MSI has also stated that it intends to fully support the new CPUs with its black socket AM3 motherboards, although it admitted that AMD hasn't been entirely forthcoming with information and samples. GIGABYTE said, "We are revising the majority of our boards to the black AM3+ socket to ensure compatibility and our new models will have revision 3.1 clearly marked in the part number."

Both MSI and GIGABYTE already have Socket AM3+ black socket motherboards on retailers' shelves but have yet to release any concrete information on whether anything other than their latest batch of motherboards will be compatible with FX-series CPUs.

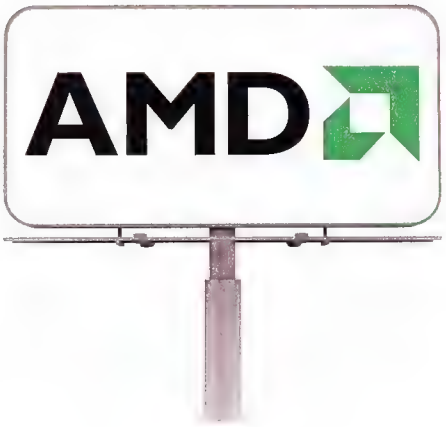
AM3+: for you and me?

The delay to the new FX-series processors is unfortunate, especially as Intel is on track to release its new high-end range of CPUs soon, possibly stealing AMD's limelight in the process. These things happen, though, and we'll just have to suffer the two or three month wait. In the meantime, AMD and its motherboard partners have decided to proceed with launching some new hardware regardless. However, the situation around FX-series processor support is a shambles.

While AMD's line is clear – buy a Socket AM3+ motherboard with a 9-series chipset to ensure compatibility – the preceding announcements from motherboard makers are confusing. It doesn't even appear that you need a Socket AM3+ motherboard to use an FX-series CPU.

This will cause wrinkled brows if you're planning an upgrade, but it might be that you've lucked into support for Socket AM3+ processors already (or via a painless BIOS upgrade). That's great news for you, but terrible news for motherboard makers and the AMD chipset sales team.

In any event, we're looking forward to AMD's new CPUs and APUs, but we'll have to wait and see if all this talk turns out to be true, and whether all this confusion was worth it: roll on September.



ASUS Crosshair V Formula

ASUS has your wallet in their sights.

Street Price $290 **Manufacturer** www.asus.com
Specifications Socket AM3+; AMD 990FX chipset; ATX form factor; 4 PCIe x16 (2 x16, 1 x8, 1 x4 electrically); 1 PCIe x1; 1 PCI; 7 SATA3; 4 USB3; DDR3-2133

Despite recent releases focusing on Intel, ASUS' RoG range of motherboards also extends to supporting AMD CPUs. The Crosshair V brings official Socket AM3+ support along with the 990FX chipset, and even sports SLI support. At $290, it's the priciest option of the lot, but it does plenty to justify this assault on your wallet.

The PCB looks rather cramped, but this is mainly due to the large heatsinks attached to the VRMs and chipset. The various components are very neatly laid out, with all the regular power connectors located at the edge of the PCB.

This is also true for the six SATA 6Gbps ports that run off the SB950 Southbridge, which are mounted parallel to the PCB for easy cable routeing. There's an additional SATA 6Gbps port by way of an ASMedia 106x controller just below the other SATA ports.

The PCB bristles with fan headers – eight in total. Two are for 4-pin PWM CPU cooler fans; this is a good move, as dual-fan coolers are very effective for hot AMD CPUs. Three fan headers are located on the bottom edge of the PCB, so wherever your case's fans are located, you should be able to power them using the Crosshair V. Incredibly, the fan power circuitry is supposed to be able to handle up to 7A – clearly, ASUS is catering for some scary ultra-fast fans or some serious daisy-chaining.

Power can also be supplied either from or to the built-in Molex connector, either powering additional devices such as fans, or providing additional stability when overclocking.

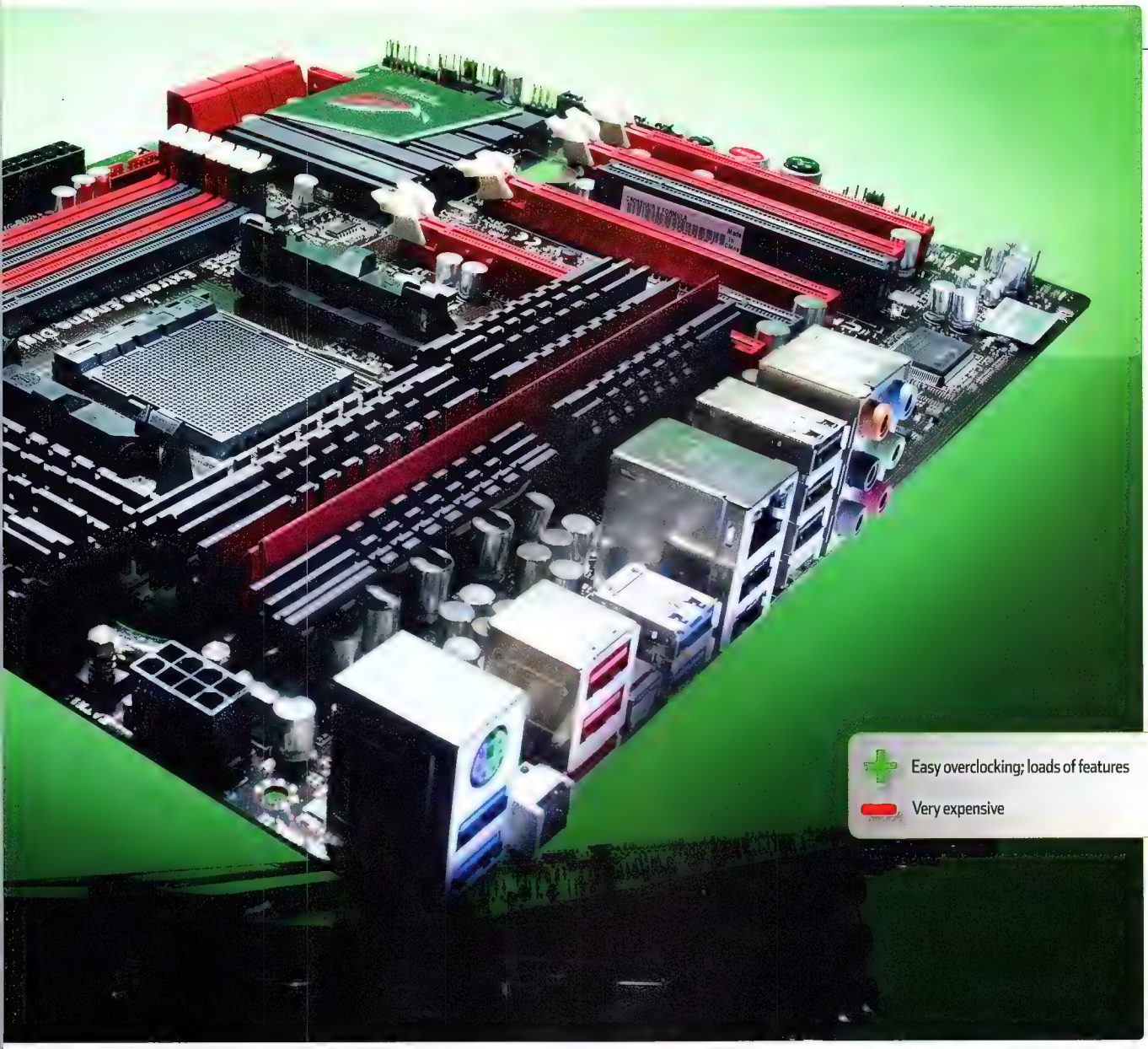
The usual RoG features are present, including RoG Connect, CPU Level Up and on-board SupremeFX X-Fi 2 audio...

As you'd expect from an RoG motherboard there are on-board power, reset and overclocking buttons, with a CMOS clear switch located on the I/O panel. There are four 16x PCI-E slots, although only triple-card SLI or CrossFireX setups are supported out of the box. If you're this way inclined, be aware that the second and third slots will only provide eight PCI-E lanes apiece, while setups based on two graphics cards will see the second slot offering the full 16 PCI-E lanes. There's a fair amount of space between the first and second 16x PCI-E slots, although this is also where the Crosshair V's only 1x PCI-E slot is located; a single PCI slot is located beneath the second 16x PCI-E slot.

There's plenty to talk about on the USB front too. There are four USB 3 ports on the I/O panel, and a USB 3 header on the motherboard to take advantage of the ever-increasing number of external drive bay devices that support USB 3 too. The usual RoG features are present as well, including RoG Connect, CPU Level Up and also on-board SupremeFX X-Fi 2 audio, which supports CMS 3D, Crystalizer and EAX 5.0 among other standards. All in all, it's a mix of overclocking features and additions that would be useful for gamers, as befits the performance-hungry gamer's expectations of RoG Formula motherboards.

The Crosshair V wasn't especially fast in our Media Benchmarks at its stock speed, recording a mediocre overall score of 1,383. However, it recorded the best performance in Arma II, with a minimum frame rate of 64fps. Its SATA speeds were excellent too; it recorded a read speed of 549MB/sec and a write speed of 467MB/sec – the former is just about the maximum we'd expect to see from the OCZ Vertex 3 SSD, although the write speed is a little off the pace.

The ASMedia 106x controller proved to be far less capable than the SB950 Southbridge, only managing a read speed of 404MB/sec and write



+ Easy overclocking; loads of features
- Very expensive

speed of 347MB/sec – no prizes for guessing the ports we recommend for SSDs – but it's nice to have extra storage options.

Overclocking the Crosshair V was a far more pleasant experience than it was with the ASRock and MSI motherboards, although it still wasn't great at recovering from ambitious overclocks – it rarely managed this on its own, although it usually just needed a single press of the reset button to make it come alive again.

The EFI was the best on test; it was snappy and responsive, and exhibited none of the lag we saw in competing offerings. As you'd expect, the EFI was well laid out and included a wealth of options in the overclocking department. In the end, the board managed a stable maximum HTT of 350MHz, which required boosting the CPU NB to 1.262V, the NB and HTT to 1.31V and the SB to 1.33V. This was the equal highest result on test, with the cheaper Sabertooth 990FX keeping pace.

The Crosshair V outshone the competition with its ability to maintain a high HTT speed when we ramped up the CPU multiplier for a final overclock. Using a vcore of 1.5V, we were able to use an HTT of 345MHz and a CPU multiplier of 12x to reach a CPU frequency of 4.14GHz.

This saw the Crosshair V record the fastest image editing and video encoding scores on test of 1,271 and 2,464 respectively, but as the CPU frequency was slightly lower than those of some other motherboards here, the overall score was average. Arma II also received a shot in the arm, with the Crosshair V's overclocked minimum frame rate of 71fps second only to that of the overclocked Sabertooth 990FX.

The Crosshair V Formula is fast, easy to overclock, and laden with useful features, although ASUS' RoG brand continues to appeal to overclockers more than gamers – a cheaper board can produce similar results and leave more cash to spend on a faster graphics card. However, few motherboards can boast such superb SATA performance, easy overclocking and an abundance of features. Only its price means that it loses out to cheaper options.

Overall

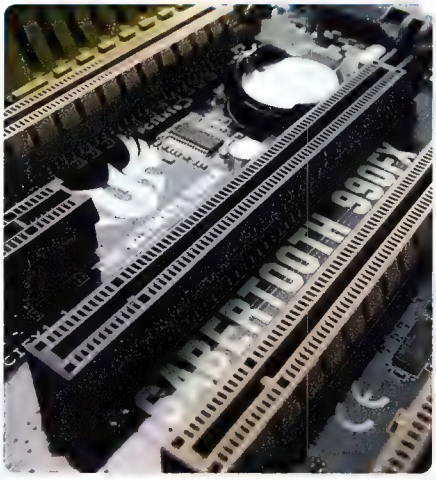
The piece de resistance, one that comes at a high cost.

82%

ASUS Sabertooth 990FX

A board with serious bite.

Street Price $245 Manufacturer www.asus.com
Specifications Socket AM3+; AMD 990FX chipset; ATX form factor; 4 PCIe x16 (2 x16, 1 x8, 1 x4 electrically); 1 PCIe x1; 1 PCI; 6 SATA3; 2 SATA2; 2 USB3; DDR3-1866



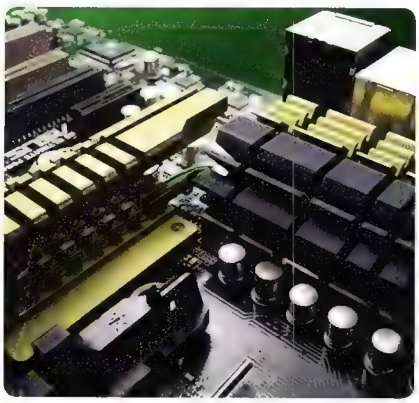
We've been keen on ASUS' Sabertooth line of motherboards for a while. They typically offer great performance and a healthy set of features, and represent good value for money too. In terms of hard cash, the Sabertooth 990FX gets off to a good start: it's the third cheapest motherboard at $245, it's sporting the off-green and black details typical of Sabertooth motherboards, with large heatpipe-linked heatsinks covering the chipset and VRMs, and it's visually unique.

The Sabertooth has a similar layout to that of the Crosshair V Formula, but the PCB is far less busy. There are six fan headers, two of which are 4-pin PWM-compatible to cater for dual-fan CPU coolers; none of these is located in the bottom half of the PCB though. To aid cable routeing, the 8-pin EPS12V and 24-pin ATX12V connectors are located at the edge of the PCB and all eight of the SATA ports are mounted parallel to the PCB.

Six of these ports are rated at 6Gbps and run from the SB950 Southbridge, while the other two run off a JMicron JMB362 controller, and are SATA 3Gbps. There are four 16x PCI-E slots, the lowest of which has just four PCI-E lanes. Installing graphics cards in the top two slots means that each has access to the full 16 PCI-E lanes, whereas if the top three slots are all occupied, the second and third slots are limited to eight lanes each. As with the other 990FX chipset-equipped motherboards on test, the Sabertooth supports both SLI and CrossFireX.

Four USB 3 ports are included – two via the I/O panel, in addition to a USB 3 header on the PCB – and there are ten USB 2 ports. As with most of the other boards on test, audio is supplied by the standard 8-channel affair using an on-board Realtek ALC892 audio codec, while the SB950 Southbridge supports RAID 0, 1, 5 and 10. Sadly, there are no on-board power or reset switches, with only a standard CMOS jumper in the way of overclocking aids.

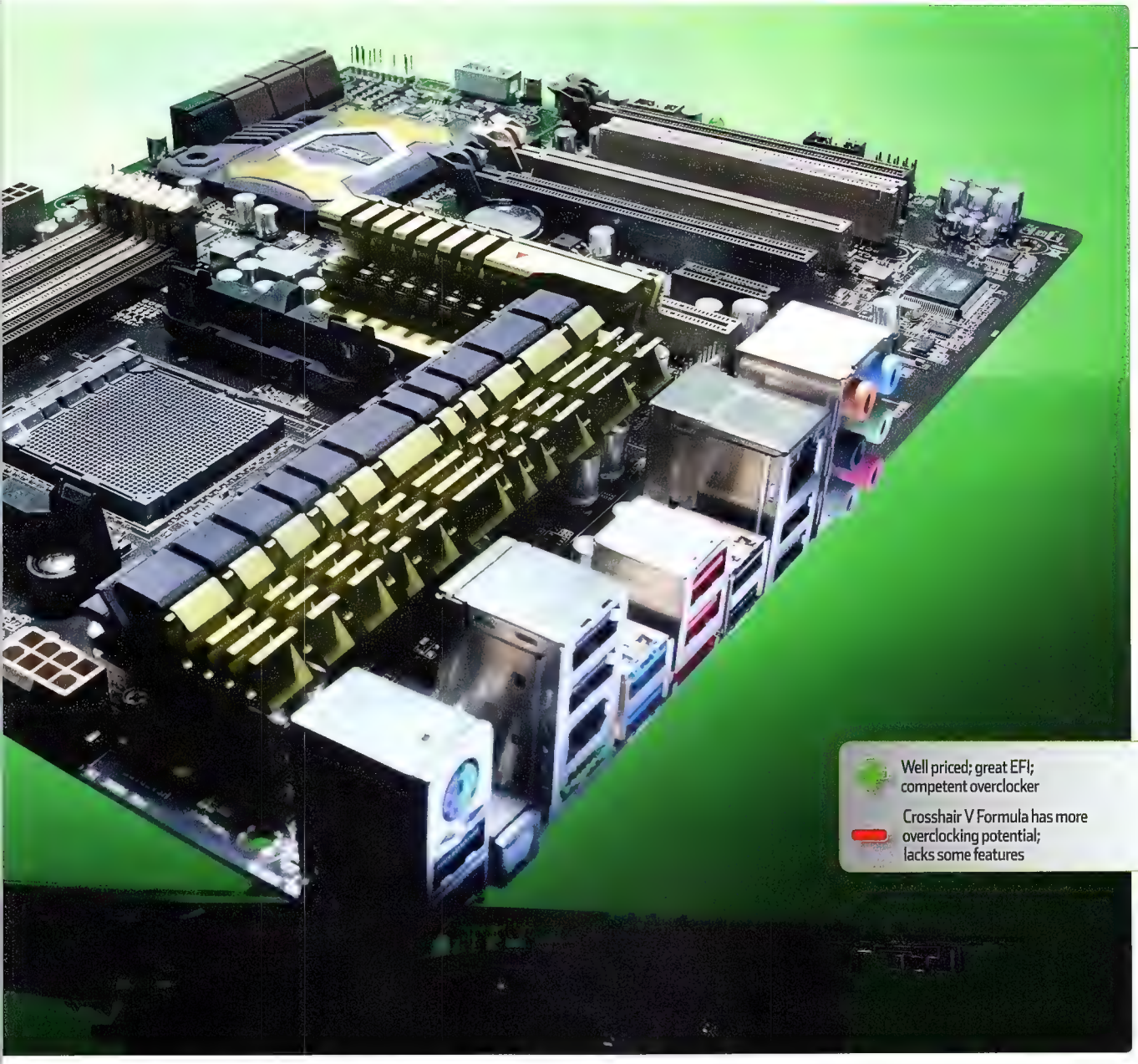
On-board power and reset buttons are an odd omission, though, from what we consider to be an overclocking-orientated motherboard...



We were keen to see how the Sabertooth performed compared with the Crosshair V Formula, and we weren't disappointed. It recorded the second highest Gimp image editing and HandBrake H.264 video encoding scores of 1,081 and 1,064 respectively. It managed to surpass the Crosshair V's multi-tasking score by 35 points. Its overall score of 1,398 was the fastest we saw of any motherboard at stock speeds. The Sabertooth was also the second fastest board in Arma II, with a minimum frame rate of 63fps, and managed some stonking SATA speeds too. The SB950 chip powered its way to a read speed of 546MB/sec and a write speed of 474MB/sec – the latter is even faster than the Crosshair V.

As we expected, the Sabertooth's EFI was fantastic – well laid out and lag-free. We reached the maximum HTT of 350MHz in no time at all by lowering the CPU multiplier and RAM divider to their lowest settings, and using a CPU NB of 1.3V, an NB of 1.325V, and the NB HT at 1.3V and SB at 1.31V. Unfortunately, as with all the other motherboards on test, the Sabertooth wasn't great at recovering when we pushed it a little too far, but unlike the recalcitrant ASRock 890FX Deluxe 5, it just needed to be manually restarted once or twice.

Sadly, the Sabertooth wasn't as adept at maintaining its high maximum HTT when we ramped up the CPU multiplier. We initially thought that the voltages we'd applied were too high, as the motherboard's heatsinks were quite toasty. However, even lowering the voltages significantly didn't allow us to use an HTT higher



Well priced; great EFI; competent overclocker

Crosshair V Formula has more overclocking potential; lacks some features

than 315MHz, combined with a fairly normal CPU multiplier of 13x.

This resulted in a final CPU overclock of 4.095GHz – not the fastest on test, but the HTT we were able to use was the second highest, and provides plenty of CPU-to-system bandwidth. The overclock did the trick too, with the Gimp image editing test score rising by 186 points, the HandBrake H.264 video encoding test improving by 402 points and the multi-tasking test increasing by 113 points. This resulted in the fastest overall Media Benchmarks score of 1,632 – nearly 17 per cent faster than the stock-speed score. The Sabertooth also recorded the highest minimum frame rate in Arma II of 72fps – a healthy increase of 13 per cent.

We were pleasantly surprised by the Sabertooth 990FX's performance both at its stock speeds and when overclocked. It consistently held its ground against much more expensive motherboards and put others to shame with its excellent SATA performance and nippy, easy-to-use EFI. It has an excellent PCB layout and enough ports to satisfy even the most hardware-packed systems.

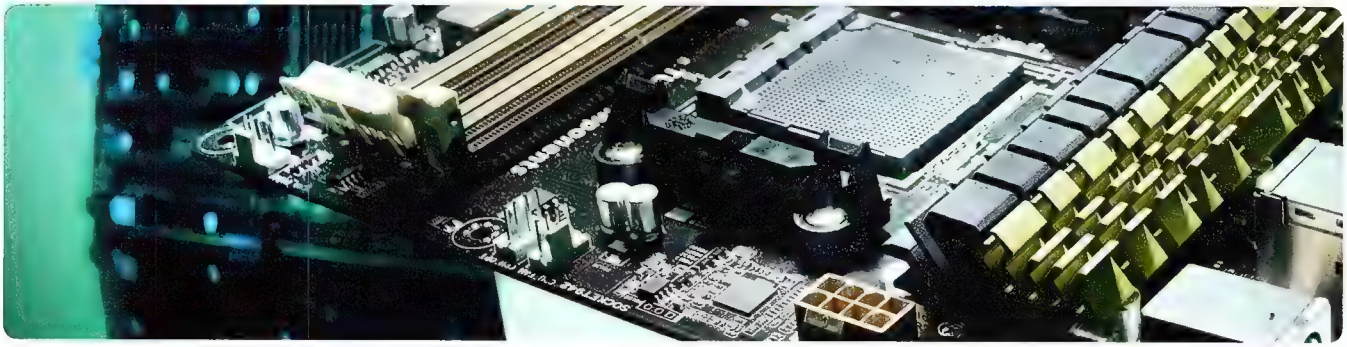
On-board power and reset buttons are an odd omission, though, from what we consider to be an overclocking-orientated motherboard, especially given how poorly the latest batch of AMD motherboards seem to recover from overzealous overclocking. Sabertooth could have clawed back some points for on-board buttons and other handy features for overclocking.

In many cases, the Sabertooth performed similarly to more expensive boards, even if it was much faster than its nearest competitors in some circumstances. Gigabyte's 990FXA-UD7 and the Crosshair V Formula offer extra lavishness in terms of overclocking, features and general pizzazz (waterblocks will be easier to buy for them too). However, the Sabertooth is the most sensible option for anyone who wants maximum performance from an AMD system for a realistic price.

Overall

The best choice in this generation of AMD motherboards.

89%



Motherboard Feature Comparison Table

	ASRock 890FX Deluxe 5	Asus Crosshair V	Asus Sabertooth 990FX	Gigabyte 990FXA-UD7	MSI 990FXA-GD80
Price	226.00	290.00	245.00	265.00	230.00
16x PCI-E	3	4	4	6	4
1x PCI-E	2	1	1	0	2
PCI	1	1	1	1	2
Storage	8 x SATA 6Gbps, 1 x eSATA 3Gbps	7 x SATA 6Gbps, 1 x eSATA 6Gbps	2 x SATA 3Gbps, 6 x SATA 6Gbps, 1 eSATA 3Gbps	8 x SATA 6Gbps, 1 x eSATA 3Gbps, 1 x eSATA 6Gbps	6 x SATA 6Gbps, 2 x eSATA 3Gbps
USB 2/USB 3	12/6	14/6	10/4	14/4	10/4
Audio	Realtek ALC892	Creative SupremeFX X-fi 2	Realtek ALC892	Realtek ALC889	Realtek ALC892
Extras	4 x SATA cables, front and rear USB 3 breakout boxes, IDE cable, floppy cable	3 x SATA cables, 1 x 2-way SLI Bridge, 1x 2-way CrossFireX bridge, 1 x 3-Way SLI bridge, ROG ThunderBolt card, ROG Connect cable, cable tie pack	4 x SATA cables, 1 x 2-way Sli Bridge, USB2/ eSATA backplate	4 x SATA cables, 2 x 2-way CrossFireX bridges, 1 x 2-Way SLI bridge, 1 x 3-Way SLI bridge, 1 x 4-Way SLI bridge	4 x SATA cables, IDE cable, 2 x molex to SATA power adapters, SLI bridge, USB 3 breakout box

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These are four of our basic systems, with something for every taste. **The Game Box** is put together with money-saving in mind, but also an eye to getting as much bang for buck. Our build has just gotten a little more expensive, but for that few hundred you're also getting cutting edge performance and one of the most overclockable chips you can get today.

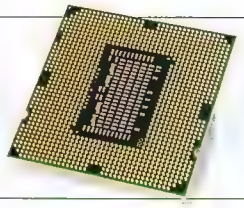
We do our (sometimes imperfect) best to make sure KitLog is as relevant as possible, but if you're looking for up to date and custom tailored advice for your usage patterns, visit our forums - it's full of the brainiest PC builders on the planet!
http://forums.atomicmpc.com.au

The Perfect PC, on the other hand, is the system everyone aspires to, with nothing but the best parts – without going crazy, though. It's a collection of all the greatest hardware that we'd pick without a budget, sure to impress with performance and sheer style.

Oh, and if you're wondering what the Ref IDs are, that's the ID of that article on our website. Just enter it like this – **www.atomicmpc.com.au/?NUMBER** – and you'll go straight to that review.

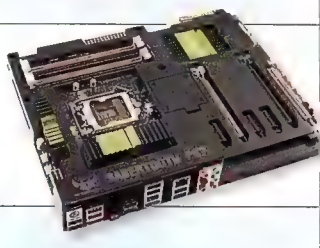
THE GAME BOX

CPU



Intel Core i5 2500-K
PRICE $220
Sandy Bridge's combination of cost and overlocking prowess is awesome.
Issue 122, Page 36

MOTHERBOARD

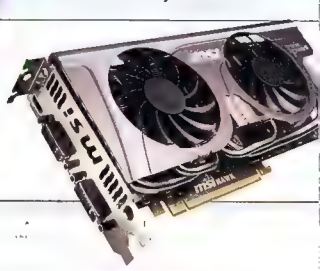


ASUS Sabertooth P67
PRICE $260
A tough, well-priced little performer.
Issue 125, Page 35

MEMORY

G.Skill Ripjaws F3-10666CL7D-4GBRH
PRICE $55
Great value, tight timings, and some flexibility.

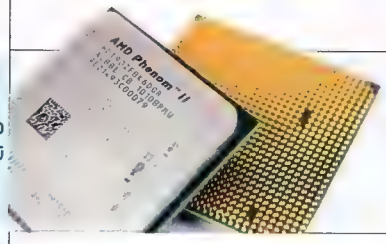
VIDEO CARD



NVIDIA GTX560
PRICE $220
A reference-design card, but plenty fast for gaming bliss.
Issue 116, Page 38

THE PERFECT PC

CPU



AMD Phenom II X6 1090T
PRICE $190
Six cores of high-powered processing joy.
Red ID: 220395

MOTHERBOARD

Gigabyte GA-990FXA-UD7
PRICE $270
Elegance and power, what more could you want?
Issue 127. pg 38

MEMORY

Corsair Dominator GT CMT4GX3M2A2000C8
PRICE $150
Red-hot memory for dual-channel speed.

VIDEO CARD

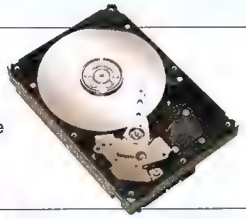
ATI 6990
PRICE $780
The new fastest video card on earth!
Issue 124, Page 36

SUBTOTAL: $1598

Coolermaster Hyper 212
PRICE $45
Nice cooling for a very affordable price.

CASE

Bitfenix Shenobi
PRICE $79
Worth it for the price alone, and sexy to boot.
Issue 125, Page 44



1TB HDD
PRICE $60
A thousand gigabyte storage drive on the cheap.

KEYBOARD

Razer Arctosa
PRICE $50
A cool-looking keyboard that'll serve you very well.
Ref ID: 149483

Viewsonic VX2233WM
PRICE $215
21.5 inches of value-packed screen, great buy.
Issue 108, Page 42

MOUSE

Tt eSports Element Black
PRICE $75
Accurate, comfortable and fast.
Issue 125, Page 39

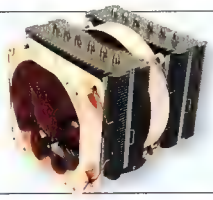
Plantronics Gamecom 777
PRICE $80
Solid set of cans with great audio.
Issue 101, Page 41

Onboard Realtek ALC889A
A decent chip that does the job.

POWER SUPPLY

Thortech Thunderbolt Plus 800W
PRICE $239
A solid PSU debut from a famed memory company.
Issue 121, Page 43

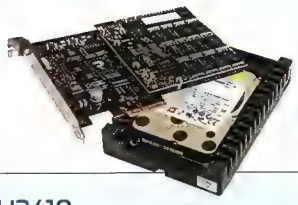
SUBTOTAL: $4379



Noctua NH-D14 CPU Cooler
PRICE $95
Bulky, yet quiet and effective.
Issue 122, Page 47

CASE

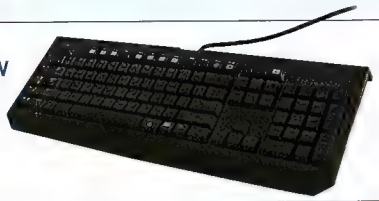
Lian-Li PC-Z70B NEW
PRICE $465
The Atomic love affair with Lian Li has been rekindled.
Issue 129, Page43



OCZ REvo Drive x2 & WD 600GB VelociRaptor
PRICE $580 + $320
Superfast SSD with zippy storage.
OCZ: Issue 121, Page 43
WD Ref ID: 220323

KEYBOARD

Razer BlackWidow
PRICE $160
The new benchmark in gaming quality.
Issue 122, Page 50



Dell U2410
PRICE $699
In-Plane Switching, 1.07 billion colours and 24 inches.

MOUSE

Microsoft Sidewinder X8 Wireless
PRICE $105
Cable-less, comfortable, lag-free and fraggable!
Ref ID: 148422

ASUS Xonar Xense
PRICE $365
Odd package, but the card alone is awesome.
Issue 124, Page 41

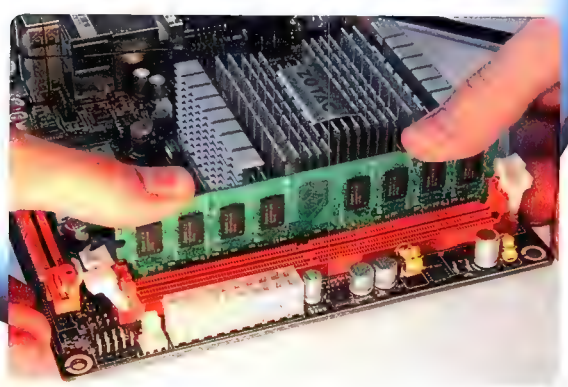
POWER SUPPLY

XFX 850W
PRICE $200
Plenty of power, ultra-stable rails and a great price.
Issue 107, Page 50

The **LAN Rig**, the ultimate in portable gaming power – go anywhere, frag anyone. No longer will you be tied to a desk or forced to awkwardly manhandle your full-sized rig, helped by a convenient handle and beefy tech. Perfect for wowing people at LANs, the tech inside is fast enough to run any game, and boasts enough speed to keep your game running at full clip even if other programs intrude in the background. After all, no-one wants to miss a headshot.

There are many benefits to running an ITX system, aside from the challenge of choosing compatible components, but here are just a few of the plusses:

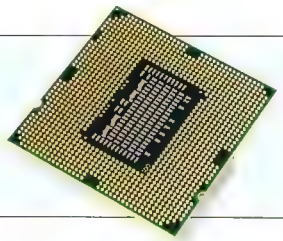
- Small footprint, so it'll fit damn near anywhere – even under a monitor.
- Lower power consumption due to restrained component choice.
- Generally low-noise due to the 'wind tunnel' design of most cases.
- Easily moveable around the house, or even taken to a mate's place – all you need is power and a screen.



Finally, for the more entertainment-minded – and really, that's all of us – there's **The Mini**, ready to play movies and music quietly and efficiently. The basic guts are fast enough for general tasks, and the IGP can handle High-Definition content. You can also choose from three entirely optional upgrades to suit your needs best: a graphics card for WoW, TV tuner to catch the game, or a Wireless card to sync without cables. The perfect energy-conscious build.

THE LAN RIG

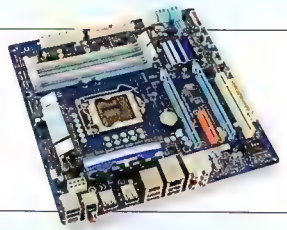
CPU



Intel Core i5 760
PRICE $200
Intel's budget quad is more than you'll need in a chip!
Issue 106, Page 36

MOTHERBOARD

GIGABYTE P55M-UD4
PRICE $200
Great overclockability, nice value.
Issue 107, Page 40

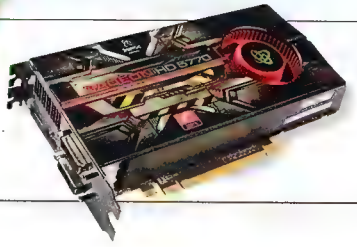


MEMORY

G.Skill Ripjaws 2000MHz
PRICE $190
Great value memory with amazing overclocking.
Issue 106, Page 52

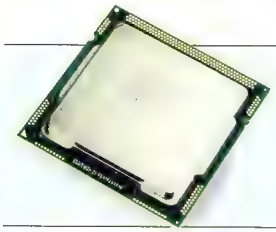
VIDEO CARD

ATI 5770
PRICE $190
A decent value way to get into DX11.
Ref ID: 169775



THE MINI

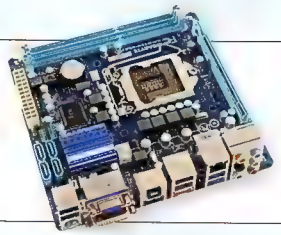
CPU



Intel Core i3 530
PRICE $140
Speedy dual-core with an IGP for HD video duties.

MOTHERBOARD

GIGABYTE H55N-USB3
PRICE $145
Tiny ITX form factor with up to 4 storage devices. Neat.
Issue 113, Page 39



MEMORY

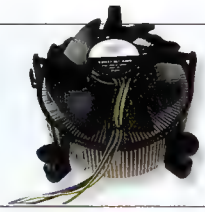
G.Skill Ripjaws F3-10666CL7D-4GBRH
PRICE $55
4GB of fast memory is plenty for running multiple HTPC media streaming apps.

VIDEO CARD

ATI 5570 Low Profile
PRICE $100
Graphical grunt in half the space. Enough for basic games, given the size.

OR

SUBTOTAL: $1550



COOLER

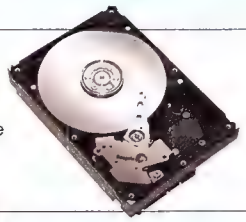
Intel Stock Cooler
PRICE FREE

Does the job, fits under PSU well.

CASE

Silverstone SG04
PRICE $160

Small case with handle; add two 120mm fans for awesome cooling.
Ref ID: 148266



SYSTEMDRIVE

1TB HDD
PRICE $60

A thousand gigabyte storage drive on the cheap.

KEYBOARD

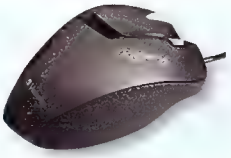
Razer Arctosa
PRICE $50

A cool-looking keyboard that'll serve you very well.
Ref ID: 149483

DISPLAY

Viewsonic VX2233WM
PRICE $215

21.5 inches of value-packed screen, great buy.
Issue 108, Page 42



MOUSE

Verbatim Rapier V1
PRICE $65

Great gaming performance and nifty features.
Issue 96, Page 43

AUDIO

Plantronics Gamecom 777
PRICE $80

Solid set of cans with great audio.
Issue 101, Page 41

Onboard Realtek ALC889A
A decent chip that does the job.

POWER SUPPLY

Corsair HX-520
PRICE $140

Modular, efficient and keeps size manageable in cramped case.

SUBTOTAL: $1138

COOLER

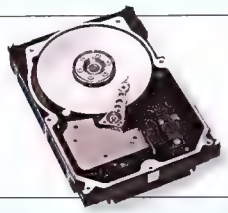
Scythe Big Shuriken
PRICE $55

Tiny 58mm height, quieter than a sponge.

CASE

Silverstone Fortress FT03
PRICE $190

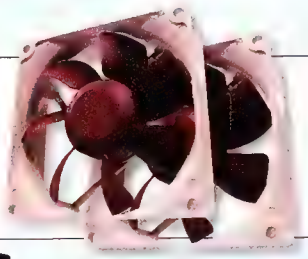
A great case for the HTPC builder



SYSTEMDRIVE

WD Scorpio Blue 640GB
PRICE $100

Fast 2.5" internal storage – grab two for more space!



COOLING

Noctua NF-R8
PRICE $22 x 2

Get some quiet, positive flow in this mini build.

OPTICAL

Lite-On DS-8A4S
PRICE $70

Slim internal DVD drive for movies, installs or backups.

KEYBOARD

Logitech diNovo Edge
PRICE $199

Wireless board with a trackpad for mousing.

TV TUNER

Leadtek Winfast PxDVR3200 H
PRICE $100

Get TV in your PC. H.264 recording ftw!

OR

WIRELESS

ASUS PCE-N13
PRICE $45

Zippy 802.11N for wireless HD video streaming.

POWER SUPPLY

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Modular, efficient and keeps size manageable in cramped case.

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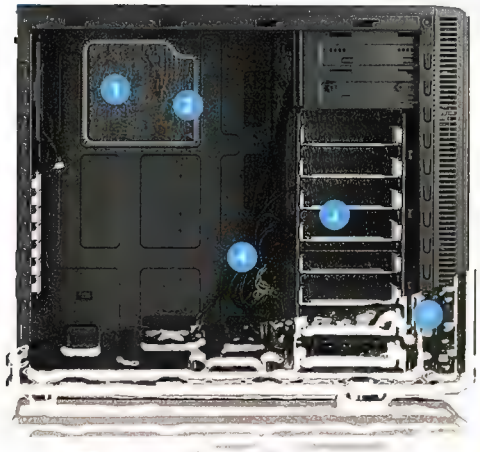

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- Paul Goodhead, bit-tec

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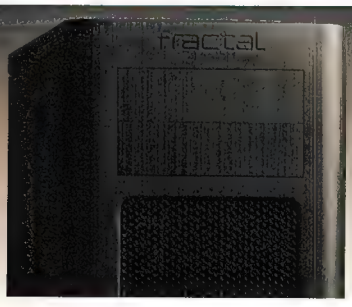

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The death of the manual

Infectious gaming nostalgia ahead.

In the days of yore, when memory was measured in kilobytes and floppy disks were the medium of choice, games used to come with manuals. Made out of paper. Sometimes quite a lot of paper.

If it'd been feasible to put the manual on another floppy disk then a lot of game companies probably would have done that. But you would have needed a whole other Commodore 64 or Apple II if you wanted to look at a disk-manual while playing the game. So paper it was.

Crusty old gamers wax lyrical about the nifty pack-ins that used to come with games, before graphics were good enough to be worth putting on the box. Tea-towel maps, and various other little knickknacks. "Feelies" was Infocom's word for all of the pack-ins; since Infocom were in the monochrome text-adventure business, they reckoned the player might get more into the game's atmosphere if provided with an unexpected rubber centipede, or some Peril-Sensitive Sunglasses.

Manuals only truly counted as feelies when they were worth reading just on their own account, not as mere instructions; which was very often the case. A good game manual could be as fun to read as a D&D sourcebook.

(And if nothing else, you probably had to crack open the manual, or your photocopy thereof, to look up stuff for the copy-protection scheme. (Which was way better than modern copy-protection schemes, because people wasted a lot less time making it.))

It wasn't a Golden Age, though, because the manual had an evil Mirror Universe counterpart: The strategy guide. Which, of course, did not come with the game. And was not, of course, free.

It was common, especially in console games, for information essential to the completion of the game, and almost impossible to figure out for yourself, to be tucked away in the Strategy Guide. Or even worse, at the other end of a telephone hint line.

Today, paper manuals for ordinary boxed games have shrunk into miserable little pamphlets. Many PC gamers don't buy boxed games at all any more; digital distribution is less of a hassle. Entertainingly, strategy guides have moved into digital distribution too.

But this doesn't, of course, matter very much, because only small children and people recently released from long prison sentences are dumb enough to pay for a strategy guide. Or pay more than cursory attention to the manual, for that matter. You can just check out the game's wiki.

If a game's at all popular, there'll be a wiki. And unless the game's absolutely brand new, that wiki will probably be much, much better than the manual, tutorial and strategy guide put together. Stats for every place and creature, detailed walkthroughs for even the easy parts of the game, and the one thing you'll never find in the official documentation: Bug lists.

I'm delighted that players are now documenting games better than the people who make the games. And not just documentation - also mods that fix bugs. Players of *Fallout: New Vegas* shouldn't have had to fix those turrets in the bottom of Vault 11 that were incorrectly set to belong to Mr House and made him cross with you when you blew them up. But at least PC players *could* fix that, without having to wait for the patch.

Again, though, all of this is a bit alarming to people whose business model focuses around selling games in boxes. Their response has been to create really, *really* fancy special edition games in boxes.

Maps, books, art books, comic books, posters. But also action figures! Plastic guns! Boxes that look like helmets! Boxes made of fake carbon fibre! The Special Edition of *BioShock 2* included a *vinyl record* of the previous game's music!

I'll be quite pleased if all boxed games become super-fancy, with the downloadable version for the mass market. Wouldn't you?

Manuals only truly counted as feelies when they were worth reading just on their own account...

Dan Rutter is happy to hold out for the "Silent But Deadly" edition of *Counter-Strike* that comes with an actual Steyr TMP.
dan@atomicmpc.com.au

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TUTORIAL CONTENTS

atomic MAXIMUM POWER COMPUTING WEEKLY NEWSLETTER

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www.atomicmpc.com.au/Newsletter/Default.aspx

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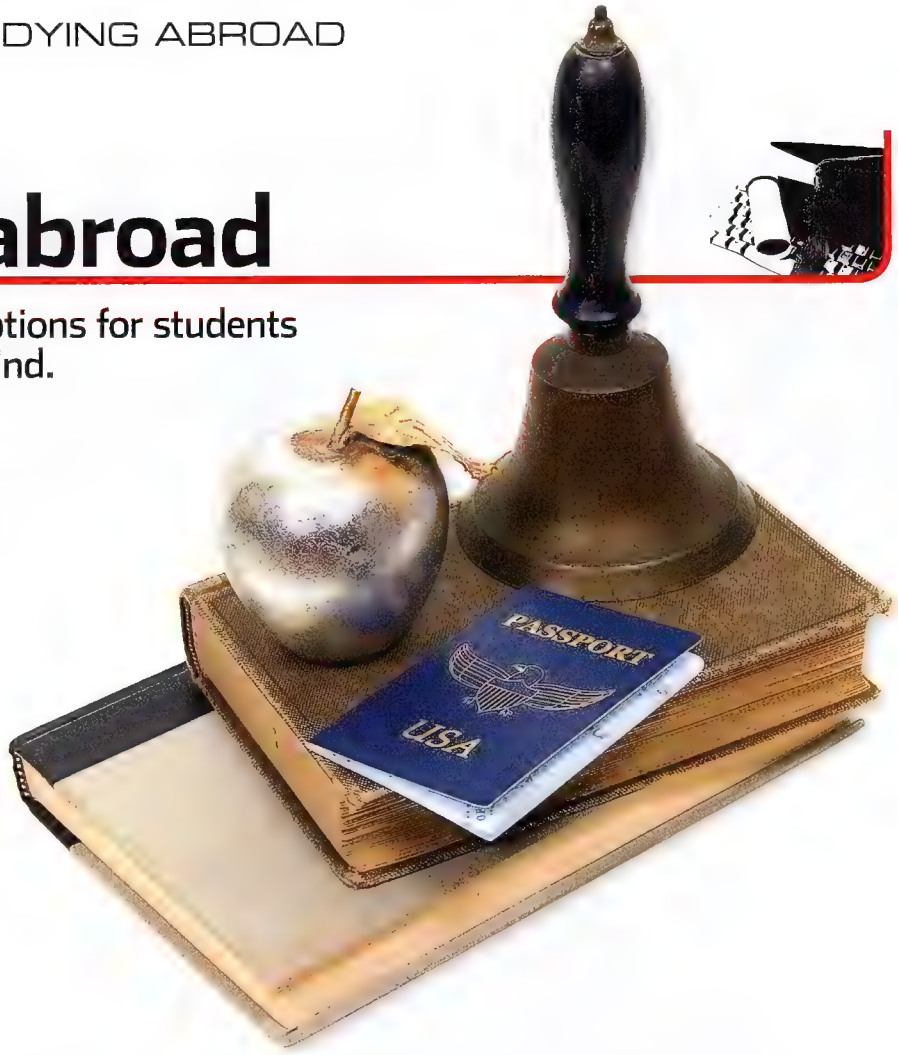
Studying abroad

Chris Taylor weighs the options for students who can't make up their mind.



If you're in the final stages of your secondary education, and intend to move on to university in a year or two, you've probably debated the merits of a 'gap year' as opposed to getting your studies over and done with and barrelling straight into full-time tertiary education. Those months after you finish school are the perfect time for travelling, so long as you've got the money put aside – you don't have to work around university calendars, you don't have to ask for leave, commitments – particularly if you're still living with the folks – are most likely few and far between. However, it's possible to combine study and travel by studying overseas. There are three main ways to achieve this.

Australian universities

Some of the larger local universities, such as Monash University (South Africa and Malaysia) and Curtin University (Singapore and Malaysia), have campuses dotted around the globe and will allow you, as an Australian student, to study a single unit/class, a semester, academic year or even entire degree overseas.

Studying overseas is an inherently expensive exercise – unless, that is, you're smart and/or lucky enough to earn a decent scholarship – but enrolling in an Australian university and then electing to undertake a small portion of your studies at their Malaysian/South African/United Arab Emirates campus is probably the 'cheapest' way out of it. The Government offers OS-HELP (**www.goingtouni.gov.au/Main/Quickfind/StudyOverseas/OSHELP.htm**), a scheme in which you can borrow ~$5600 to put towards study, accommodation and travel expenses. Accommodation, particularly on-campus accommodation that includes meals and all manner of services, can be really expensive. If funding the trip is going to be a problem, universities may offer loans or scholarships for those intending to study overseas, in partnership with banks or local businesses.

Keep in mind that the international campuses of Australian universities are typically nowhere near as large as their local siblings. The range of subjects and courses on offer differs considerably. If the option of heading abroad for a semester or two is something you're really interested in, ensure your university actually offers relevant subjects outside of Australia.

Also on that note

Universities in Australia are often partnered with universities in other countries. One of the benefits of this is that it's relatively painless – so long as you've got the money – to head overseas as a student of Australian National University or the University of Melbourne or University of Wherever Else and undertake part of your degree at a university on any continent. As with Australian universities that actually have their own campuses in other countries, there are limitations. Typically a university's relationship with another institute is centred on one or two faculties. Maybe you can go to some university in Canada to study law or engineering, but if you want to study computer science or commerce you'll have to go elsewhere – at least if you intend to go only for a semester or two as an Australian student enrolled in a local university.

The partnership arrangement means you'll only study part of your degree overseas. The bulk of it will be studied locally. Your classes at the foreign university will most likely be delivered in English (if you want to go somewhere where classes are delivered in another language, expect to sit some sort of language competency exam similar to IELTS).

You may be eligible for some form of financial assistance, be it through the university, scholarships or the Government. Keep in mind that you probably won't be allowed to work when you're overseas. Some countries force exchange students to get special visas, the conditions of which tend to be more restrictive than regular student visas.

Studying in another country has the potential to be a very rewarding experience if you can afford it, whether you study all or just part of your degree there.

Enrolling overseas

If you opt to become a true international student – that is, enrol at a foreign university with the intent of completing your entire degree there – you're not going to be eligible for any form of Commonwealth assistance. Assuming a local equivalent of HELP exists, you also probably won't be eligible for it. Keep in mind that some countries don't allow students to work; or if they do, place severe restrictions on the number of hours students can work, particularly during the academic year. This is where studying overseas starts to get really, really, really expensive.

Some universities offer a lot of assistance to foreign students, such as scholarship and loan schemes to help you foot the bill for your accommodation and studies. Most universities offer some sort of accommodation either on or very close to the campus, which will likely be as costly as it is convenient. You might be able to eventually move out of the university's own accommodation and into a regular rental property or share house, but in other countries this may not be safe or legal. Some universities, governments and organisations claiming to be affiliated with both offer 'easy' employment opportunities or home stay setups. Approach such schemes with caution and scepticism. They may be legitimate ways of earning enough money to buy textbooks and the occasional six-pack while having an interesting experience. They may also be scams worthy of a hard-

hitting 'Today Tonight' expose, taking advantage of foreigners' lack of understanding of local industrial regulations.

If you're intending to study somewhere that places severe restrictions on students working or simply forbids it, expect to have to prove to the powers that be you have enough money to keep yourself afloat before they give you a student visa. Calculating study-related expenses is easy enough – universities, funnily enough, tend to do a reasonable job of telling you how much money you're supposed to give them – but working out other expenses when you haven't been to a country before is difficult (some guy you talk to online might have a very different understanding to you of acceptable accommodation and cheap food). There exist websites such as StudyHK, which provides (we're not sure how accurate these are, mind you) itemised lists detailing living expenses and speaks in terms of day-to-day items: train tickets, pints of beer, fast food meals. Similar websites exist for explaining the ins-and-outs of migration law to international students.

The process of applying for student visas can be convoluted. Expect to pay fees for different things, fill out lots of forms, endure interviews and, depending on where you want to go, even provide a (refundable) deposit to prove that yes, once you've earned your degree you'll go back where you came from immediately.

A fairly common hurdle for students to have to jump is the language competency test. You'll obviously have to endure one of these if you intend to study in French or Arabic or Chinese, but you may also have to sit – and pass – such an exam before you're allowed to study in another English-speaking country.

There are also academic requirements that go beyond a specific ATAR score and a reasonable performance in a science subject. You may have to sit one or more standardised tests to be considered for entry into any course at any university. These tests can be sat in Australia but often need to be done at a specific location at one of several different times throughout the year.

The amount of information about what hoops you need to jump through to be an international student varies considerably from country to country. Japan and France give prospective students a lot of information about academic requirements, work restrictions (basically you're not allowed to whore yourself out in Japan to cover the cost of your textbooks), migration requirements and damn near everything else. China (beyond Hong Kong, which has a decent website) only provides prospective students with basic information – here's the visa you need to get, here's some people you can call or mail to get the process in motion, here's an example of terrible web design. Our own government (www.studyoverseas.gov.au) provides some useful information and links.

Sea men

There are some opportunities available that combine travel and study on a whole new level. Semester at Sea (**www.semesteratsea.org**), for example, combines the joys of being on a cruise with lots of other young people and a significant gender imbalance (there's a page on the site with disturbingly specific statistics about the gender, ethnic and geographic backgrounds of the ship's current passengers) with, er, studying things from the commerce or arts faculties. Not that a lot of studying will get done while trapped on a ship for that long...

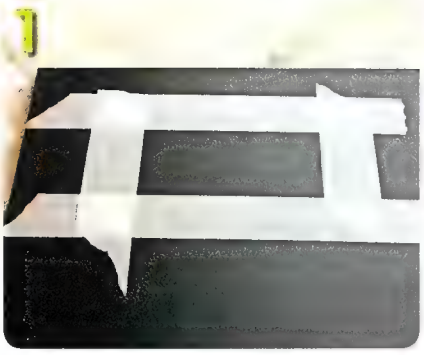
how to...
Make a custom side-panel window

Antony Leather shows you how to display your cutting-edge components to admiring onlookers by installing a window in your case's side panel.

If you've kitted out your PC with the latest shiny hardware but your case doesn't have a side-panel window, fear not. It's easy to make one yourself so that you can show off your pride and joy to your friends. Being able to view your PC's interior is a great way to display just how unique your case is, especially if you've installed LEDs or cathodes. All you need for this classic two-hour mod is a Dremel or jigsaw, plus raw materials. And it's always possible to cut custom designs into the panel for a uniquely-shaped window.

tools you'll need

- Jigsaw
- Spare Jigsaw Blades
- Rotary Cutting Tool (eg Dremel)
- Metal Files
- Safety Goggles
- Acrylic Sheet
- Masking Tape
- Rubber U-Channel
- Double-sided Mounting Tape OR Nuts and Bolts



MASK UP

Start by masking up the inside of your side panel. Working on the inside means that any scratches will be made on the interior surface rather than the visible outer panel. Marking the tape with pencil will give you an idea of the size of acrylic sheet you need. There's plenty of choice in terms of colour, but make sure you opt for tinted or clear acrylic rather than a sheet made from a solid colour, as you want to be able to see through it.

MEASURE UP

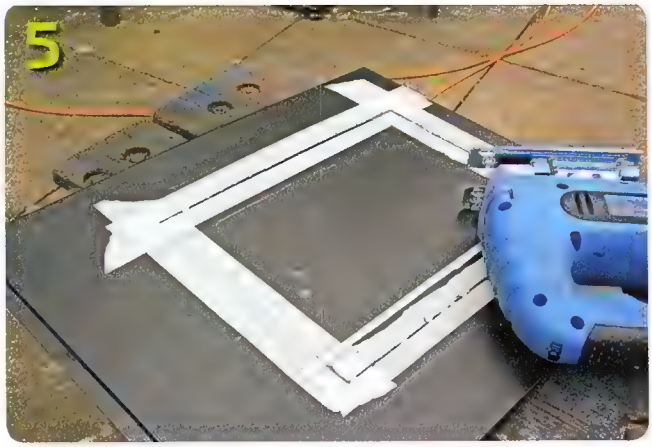
The next step is to finalise the location of the window on the side panel by drawing on the masking tape you've applied. Make sure you position the window so that it overlooks the appropriate area inside your PC. Don't be afraid to move the masking tape and start again – measure twice, cut once. Speaking of which, it's time to put on your goggles!

PREPARE YOUR WORKING SURFACE

It's important that you cut on a solid, flat surface, such as a workbench, when using the jigsaw. Also check that you won't cut through anything under your side panel and that the underside is protected from scratches with a thin cloth or newspaper.

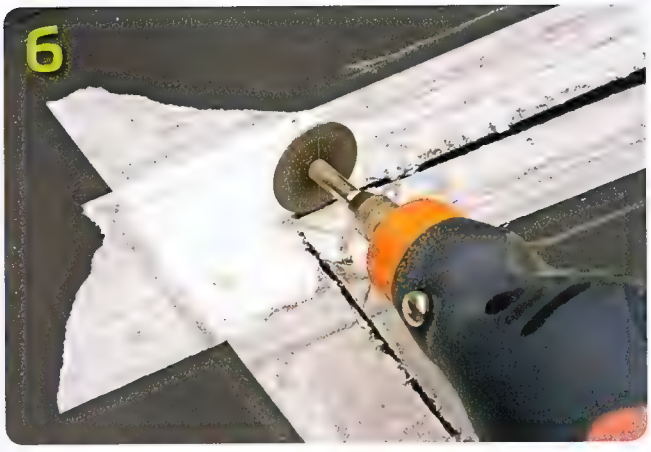
CUT A PILOT HOLE

Once you've double-checked your measurements, it's time to start cutting. If your side panel is made of aluminium or thinner steel you may be able to use a Dremel to cut the window, but it's usually best to use a jigsaw, as it will result in straighter lines and is more adept at dealing with large areas. Use a Dremel or small drill bit to cut a pilot hole for the jigsaw blade to begin cutting.



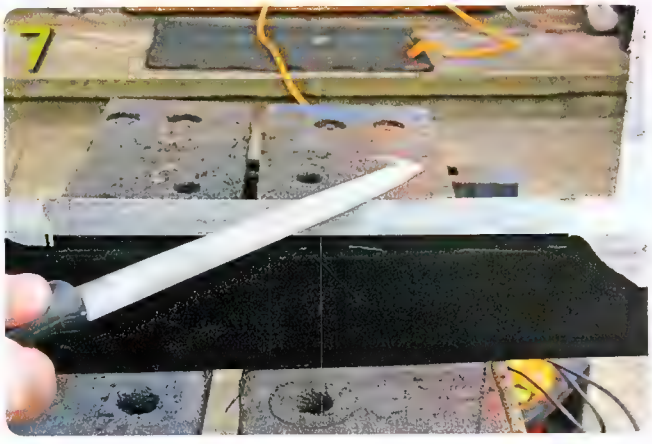
START CUTTING

Take your time to begin with, especially if you're using the jigsaw or its blade for the first time. If your jigsaw has an edge guide, this is the time to use it, as it will make cutting a straight line much easier. Be careful not to apply too much pressure to the blade or it may snap.



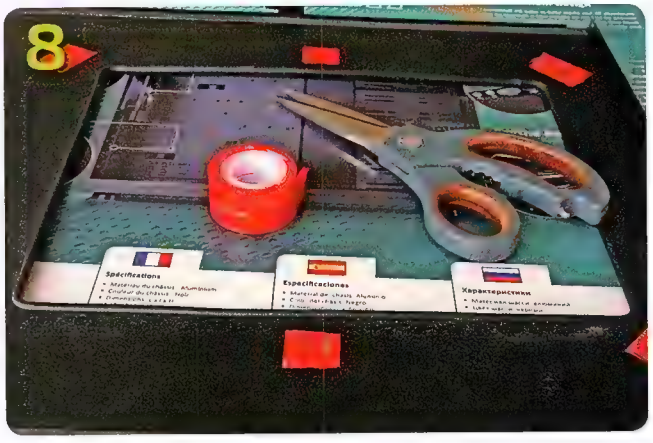
FINISH THE CUT

Stop just before you reach the end of the lines you've drawn, as it's easy to go too far. Instead, leave a few millimetres spare and finish the rest off with a Dremel or file.



FILE IT SMOOTH

Discard the cut-out section and use a metal file to smooth the panel edges so that there are no metal splinters or jagged bits.



INSERT THE U-CHANNEL AND APPLY TAPE

Now insert the U-Channel trim around the edges of the window. It will bend slightly around corners, so make the ends meet along a straight edge so that the join is as inconspicuous as possible. Once that's done, place adhesive tap as shown.

APPLY THE WINDOW

Dremel the acrylic to size if too large, remembering to go very slowly as friction may cause the panel to melt. Apply several small pieces of mounting tape to the panel and then fix the acrylic in place. For a more secure mount drill holes through the panel and acrylic, then attach with nuts and bolts.

MOD COMPLETE

Your mod is now complete. The mounting tape doesn't need any time to dry or set, so you can attach your side panel immediately. Post your result on the Atomic Forums for all to see.

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GAMEPLAY

GAMES, GAMING AND GEEKERY COVERED... ATOMIC-STYLE

Have you been waiting patiently for Sheppard's return in the stupidly popular Mass Effect series? Do you lose sleep at night wondering if the third game will live up to those before it? Does the prospect of many more hours of gaming give make you shiver excitedly? Well we've got a feature just for you.

And if that last, slightly disturbing sentence describes your response to spending hours with games, be sure to check out our huge feature on buying games for cheap – no longer will your game-lust be restrained by your mortal Aussie income!

To top it off we've got a review of the critically-acclaimed Deus Ex: Human Revolution, as well as a treatise into the super-violent Gears of War 3.

...tissue, anyone?

GAMEPLAY CONTENTS

MASS EFFECT 3

Changing the shape of RPGs.

You know the brand name and you know that the conclusion to Commander Shepard's story arc is hitting early next year. But what you might not know is the meta implications of Mass Effect 3 and the future of RPGs. Nathan Lawrence delves a little deeper.

While the gaming world was recently introduced/reintroduced to one of the most renowned sci-fi fuelled RPG/FPS franchises of all time, Deus Ex, another series of the same subgenre edges closer to being on a PC near you. Mass Effect has had a relatively speedy rise to fame from the release of the original game in November 2007. In fact, a quick Google or Wikipedia search of the 'mass effect' phrase reaps more information related to the sci-fi role-playing shooter (RPS) phenomenon than the medicinal description of a growing mass. And like the medicinal mass, the Mass Effect series continues to grow.

But this growth hasn't been reliant on a prequel 'reboot' like Deus Ex: Human Revolution, or the reimagining of a series with Fallout 3 and its subsequent sequels. Instead, Mass Effect continues to gain critical mass in a consistent and persistent arc as the gaming world waits with bated breath to see what happens next.

Feeding the right dog

At their core, RPS titles attempt to broaden their appeal by attracting two big but very different markets: the shooter crowd and the RPG lovers. Of course, this comes with an inherent risk. Favouring one market more means that BioWare runs the risk of alienating the other. In our interview with Michael Gamble, associate producer at BioWare, he was careful to accentuate just how much the developer understands the importance of catering to both.

"So it often seems as though one thing comes at the expense of another. When you're developing a really, really awesome shooter, you want to make sure that it's tactile and you can move around the battlefield like you would in any other shooter, but at the same time we have this kind of old school perception that when you're doing RPGs it's all about numbers on the back end and things like that. So to marry those two is difficult, and what we have to focus on is just to make sure that combat feels personalised. But when you play a role-playing game, role playing is the most important thing. You want to be able to do things that you would in real life. So you have to find a way to actually say, 'This is

how I'd fight in combat. This is how I'd defeat these enemies.'"

Breakfast of champions

We were lucky enough to be the only Australasian journalist invited to a breakfast round-table discussion with a panel of heavy-hitting RPG bigwigs. From left to right (see image below left) was Dr Greg Zeschuck, general manager at BioWare Austin; Eugene Evans, general manager at BioWare Mythic; Ken Rolston, lead game designer on Kingdoms of Amalur: Reckoning (as well as The Elder Scrolls: Morrowind and The Elder Scrolls: Oblivion); Keith Stewart of Edge Magazine was in the moderator seat; and last but certainly not least was Dr Ray Muzyka, group general manager and the CEO of BioWare.

This wasn't a place for opinionated journalists to ask what they felt were poignant questions; oh no. It was, instead, a safe place for this collection of RPG gurus to impart wisdom for us mere mortals to bask in. And bask we did.

Upping the ante

A lot of BioWare's focus with Mass Effect 3 revolves around the idea that this third entry is the final chapter of Commander Shepard's story. That's not to say that we won't see more Mass Effect in the future, but BioWare is looking to make the third Mass Effect outing much bigger than before. One such area that BioWare is raising the standard is in the combat. Michael broke it down for us:

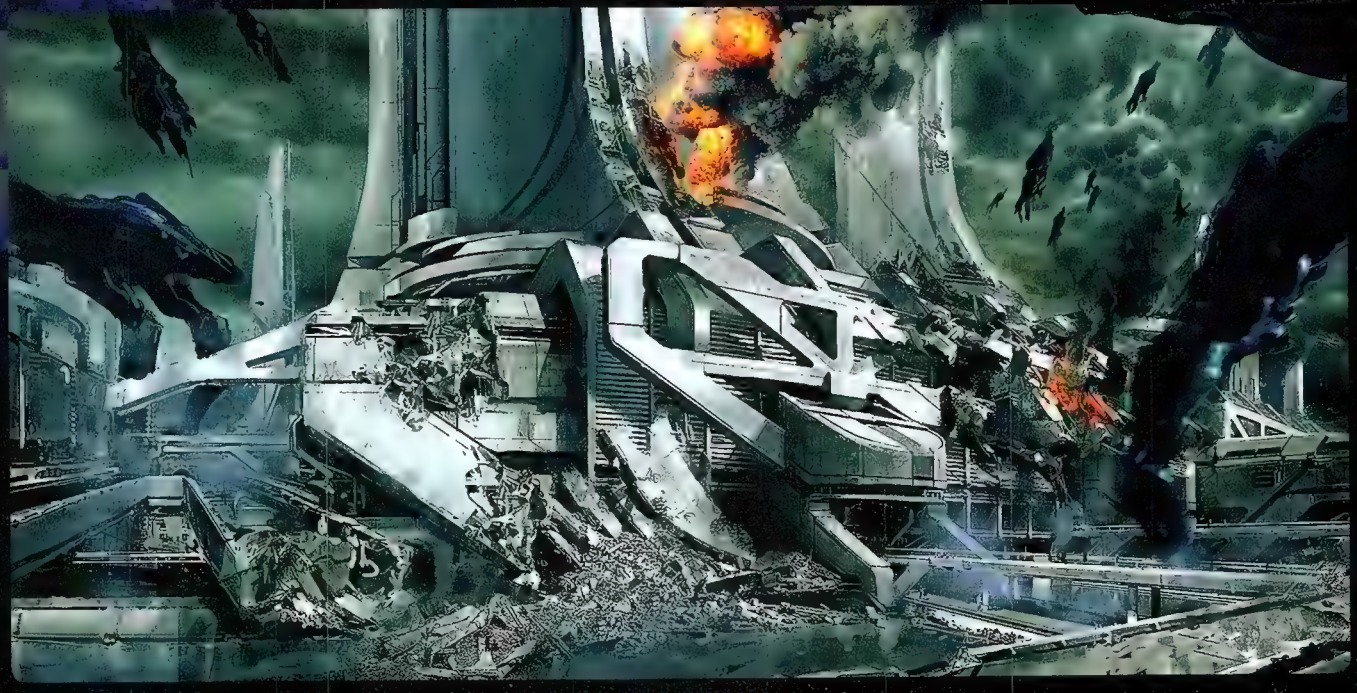
"So we're still using the Unreal 3 engine but we've done a lot of work to bring a better particle system into the game and that adds a kind of different level of dynamic-ness to the combat; especially the enemies that use things such as smoke, which you may have seen in the demo. Those kinds of things are in. You'll be able to have a 3D battlefield in a way where you can move up, down, all over the place... jumping over gaps and ladder climbing, and all that kind of stuff changes up the combat."

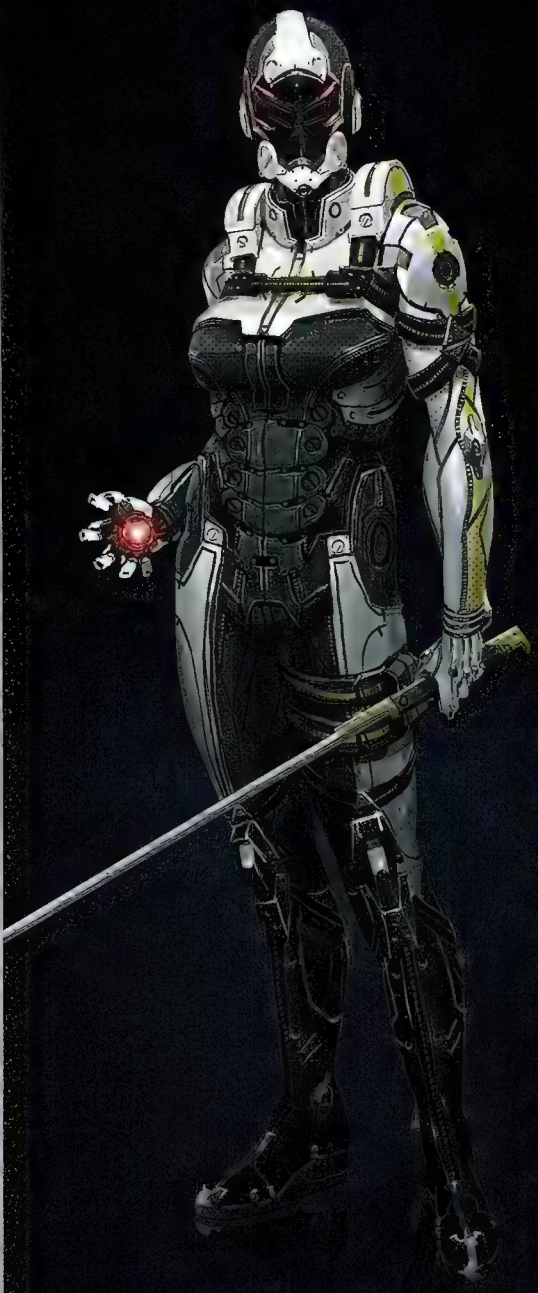
"Combat in Mass Effect 3 is much tougher than ever before: Veteran is the new Normal... things get really intense on the battlefield"

Smoke and mirrors

During our hands-on time we got to experience the effect that smoke had on combat and AI behaviour, among other things. Project manager Ryan Warden offered a prelude to the fight we were about to undertake. "Combat in Mass Effect 3 is much tougher than ever before: Veteran is the new Normal. Mass Effect 3 is all about choice and you're going to utilise some of that choice in the upcoming combat section. When things get really intense on the battlefield, you can always bring up the power wheel to pause the action and issue precise individual attack orders to your squad. Bring up incendiary ammo for a little added fire. The enemies you'll see in this upcoming area are carrying shields, so a full-on frontal attack is not an option. You'll need to utilise squad powers and tactical flanking if you're going to make it through."

Eager to call 'hyperbole', we wanted to see just how well these shield-wielding Cerberus soldiers could hold us off. Ryan didn't lie; short of explosives, there was no budging these guys with conventional rounds from the front. It forced us to make use of the improved cover system for





flanking unseen behind the enemy's defensive line for a few choice headshots and, of course, a stylish Omni-Blade melee finisher. But as innate as the action component of Mass Effect 3 is, that doesn't take into account the importance of the other elements at play.

Forming an emotional connection

Both during our time with Mass Effect 3 and at the breakfast discussion, everyone seemed to be stressing the importance of emotional engagement. For the presentation, this took the specific form of a poignant decision to save a Newt-like air-vent-dwelling child during a full-scale Reaper invasion of Earth. During the breakfast, it was a more general expression of the importance of any game—RPG-fuelled or otherwise—to emotionally engage the player. Ray expanded on this point.

"One thing about Mass specifically, the reason we do all this, is we're trying to create emotional engagement with the player. I think a lot of other games are trying to do that as well. And the systems we use, why I think they're powerful, if I was to sum it up in a few words, they're emotionally powerful. They engage you at a deep level; they make you feel like you're playing the role. And they make you feel like you have a purpose, they make you feel like your actions aren't just momentary, y'know, combat only. They make you feel there's persistence across the different maps you explore, the different things you find, how you progress your character. And I think that touches us all on a deep level."

The perfect mix

Finding the right balance of instantaneous action and RPG breadth is one of the specific challenges of Mass Effect 3's game design, but short-term accessibility for newcomers versus long-term in-depth systems is an overarching consideration. Ken feels that a certain popular board game addressed this issue already.

"Monopoly solved that problem. When you play Monopoly you've got the short game and the

Interfacing players

One of the topics that Ken and Ray touched on a lot was the importance of the player interface and how often players look to it for guidance in what to do next. Ray explored the topic in-depth. "It's interesting to observe what players do next because they look at that interface element probably to help inform their next decision. Why do you want to look at the map? Are you trying to solve a quest? Are you looking for a combat arena? Are you looking for a store? These are all interesting things to know from a player perspective. And once you understand that you can understand, do they really have an hour or two, or do they only have 15 minutes in this session? And it's really a marriage of that artistic side, from the development perspective, and the passion of what the players are looking for emotionally, and trying to make sure that you marry those well."

long game. I think we ought to, in terms of the way we design our games, start moving in the direction so that when you see the game, you know what your choices are like. If I just wanna play through the main quest, which is insane to me—Why would anyone wanna do that? I wanna wander everywhere!—but if you do that then we sense what you want to do and make glowing footprints move in that direction. We need to be alert to whatever signals we can pick up from the user and then follow them."

Aural pleasure

Those who felt that the soundscape was lacking in previous Mass Effect outings will be glad to hear that BioWare is working hard to remedy this. Michael had these thoughts to share when we asked about talk of an audio overhaul. "It's not as much an overhaul as it is making sure that the weapons sound as awesome as they can. I mean, now that we have the time to do it, we do it. They have to be hard hitting, they have to be basically very impactful on the arms, right? And that goes for powers as well. We had to make sure that all the in-level audio—including the ambience and music—is basically as top quality as we can make it."

Links in the activity chain

A term the panel threw around a lot at the breakfast was 'activity chain', and its importance not just to RPGs such as Mass Effect 3, but also to all games. Activity chains are best defined as in-game systems of varying complexity. Ray expressed just how crucial they are to the player. "The good news is that we're actually embracing all the different elements, which goes back to that concept for BioWare which is very critical, these activity chains. I think all games have 'em. And that's actually how the RPG elements get added in is they get added in as activity chains to allow you to have something to look forward to and to say, 'Look I just got a new weapon, I'm logging off.' Great. But then the next time you log on, you can come back and you've got persistence and you can reuse that or evolve your game state the next time, so you're always looking forward to it. And that means you always have something to look forward to doing in a game."

"One thing about Mass specifically, the reason we do all this, is we're trying to create emotional engagement with the player..."

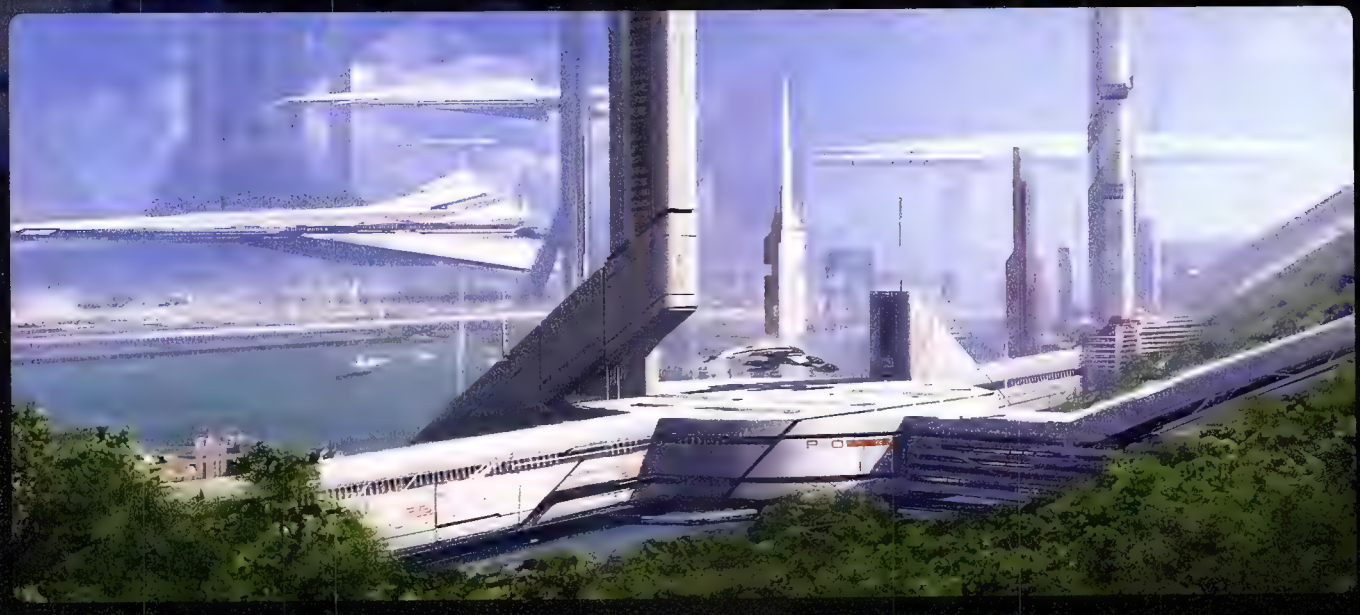
The future of RPGs

Out of the many topics, the future of RPGs was perhaps the most interesting. There was a lot of discussion of multiplayer, the supposition that single-player will die off in the not-so-distant future and how interconnected mobile platforms can add to the RPG experience. All members of the panel had their own spin on how they saw the future of the RPG, but Eugene summed it up best with his stance. "I think the always-connected person, the person with the phone that's as capable as it is now and will be in the next couple of years, means that they expect that to be part of their everyday life. We should expect that to be part of their everyday gaming life, too. And the opportunity to make that an extension of what they're doing in a game, is going to be very, very powerful; as a way to keep them engaged.

"Because you only have so much time to play, but you do have time when you're on the bus, you do have time when you're waiting around for whatever. It's a way to keep them engaged and re-engage them so that they're going to want to get back home to play the game. They're going to want to get back to their couch, their desk, wherever it is to play. And that's only going to, I think, create more excitement around games, because that excitement comes from being pulled back into that universe all the time."

Ray expanded on Eugene's idea in how he saw a link between the past, the present and the future of RPGs. "Nowadays, we can actually create worlds that look real. And now the systems can handle that and you can create engaging dynamics of AI and the world interaction and multiplayer interaction and social interactions, and everything the player dreamed, I think, 30 years ago we're not at the real starting point for computer games. We're at the new beginning where everything we imagined is possible."

Whatever the future of RPGs holds for gamers, we're excited to see what BioWare can bring to future genre entries; both in the Mass Effect universe and beyond.




ROCKSTAR GAMES PRESENTS
L.A. NOIRE
N7

GAMING THE SYSTEM

Justin Robinson logs on with essential money-saving tips for every gamer in Australia.

Gaming is awesome. Incredible. We'd even go so far as to say it's stupendous – but even more so is the cost to our wallets. Once you add up the cost of a fast gaming PC, or a console with enough accessories and a big enough screen, and then factor in the price of games, many of which cost well over $100 in stores, gaming as a hobby can be quite expensive. But don't stress – Atomic to the rescue!

We've assembled all our knowledge on alternative sources for your gaming fulfilment, from local stores in Australia to far-off retailers on the other side of the planet. Inside these next few pages you'll find out how to buy online and how to be safe at the same time, and at the end of it all you'll be able to save yourself some serious cash that can go towards practical things like bills and groceries – or simply buying more games.

Whether you're buying yourself a game, or are looking to snap up some early Christmas presents for others, you seriously cannot do without our knowledge. So read on, dear Atomican, and give yourself the gift of cheaper gaming.

Safe spending

When you can't hand over wads of cash, how can you know your money reaches the seller?

Luckily for you, it's not all doom and gloom when buying online. There are now mature online sellers that handle your cash in a very reliable and professional way, some with a measure of protection in the rare event that something goes wrong. By ensuring multiple strong passwords are used (eg: aT0M1c-l$-oRsUm), connecting to site checkouts through 128 or 256-bit secure 'HTTPS' servers, and transferring money safely, online shopping can be just as reliable as buying from a physical store.

The most effective way to ensure you don't lose your hard-earned is simple: use common sense. If a seller appears dodgy, or has many negative posts from users online, they're probably one to steer clear of.

Bank Transfer

As one of the first forms of transferring money online, Bank Transfers are quite reliable. Simply copy-and-paste the seller's account details into your online banking service and your money will be – irreversibly – sent to that account. This also means that incorrect details will see your money sent into a black hole from whence it shall never return. An acceptable choice.

Debit and Credit

Many online sellers will accept this as the only payment option. It is a reliable and flexible way of paying – either using your own money with Debit, or borrowing with Credit – which is offered almost universally. In the case of a dodgy seller it may be possible to contact the issuing bank for a 'chargeback' of funds. Some banks offer SMS services that transmit a unique one-time code when online purchases are made, further enhancing security. A solid choice.

PayPal

PayPal can be used with a standard bank account or Debit/Credit cards, and its reach is rapidly expanding. All transactions are passed through secure HTTPS servers after initial bank account verification, and receipts are emailed with every purchase. Offers an SMS service, and purchases of physical goods of up to $20,000 can be disputed through PayPal with the possibility of a refund. Our first choice by far for convenience and security.

Game Store Price Comparison

	Duke Nukem Forever	The Witcher 2	Portal 2	L.A. Noire (360)	Red Faction: Armageddon	DiRT 3	CoD: Blops	Starcraft II: WoL
OzGS	$43.99	NA	$27.99 (65% Saved!)	$55.99	$34.49 (61% Saved!)	$32.99 (58% Saved!)	$38.99 (56% Saved!)	$52.49 (34% Saved!)
Steam	$76.80	$72	$48.00	NA	$67.20	$48	$86.40	NA
Play-Asia	$38.16 (61% Saved!)	$47.72 (46% Saved!)	$36.62	$42.94 (60% Saved!)	$38.16	$38.16	$52.50	$57.29
JB HiFi	$79	$84.98	$79	$89	$79	$79	$89	$69
EB Games	$98	$88	$79.91	$108	$88	$78	$79.92	$79.92
GoG	NA	$69.99	NA	NA	NA	NA	NA	NA

Best Price Worst Price

Prices are correct as of 14/06/11

JB Hi-Fi Online www.jbhifionline.com.au

Just like walking into the store, but easier.

As one of the largest and most recognisable retail brands in shopping centres across the country, JB Hi-Fi is a well-known staple of the gaming enthusiast – in many cases offering a retail-competitive price seemingly always a few bucks less than the competition. Their online service is dressed in the same canary yellow garb as real life, and to some extent echoes the haphazard nature of the brick-and-mortar stores.

Though it is easy to find the gaming section on the site, dialling down into specific games requires use of the search engine. Confusingly the gaming section claims that only "139 Available Items" are kept, but these are the most recent titles and do not include all titles in the database, which can be ordered with a small wait for stock. JB online is certainly not the best place to find obscure or older games. It's reminiscent of sites from years past, and though functional, it lacks polish.

Pricing is identical to the retail stores, but is not especially tempting compared to digital and overseas services. Checking out is somewhat straightforward, and offers either Debit/Credit or PayPal through 128-bit AES HTTPS encryption. In JB's favour is free shipping that took only four business days to arrive from time of order, packed very snugly in a padded post bag. If other products such as DVDs or CDs are ordered they will be shipped separately.

Shopping with JB Hi-Fi online should prove just as safe as purchasing in-store, with the convenience of free delivery; though you'll almost certainly find the games cheaper elsewhere.

Site Security: HTTPS 128 AES
Prices: High
Payment Options: Credit/Debit, PayPal
Delivery Time: 4 Business Days

Why buy local?

While in most cases it makes sense to buy from the cheapest source (as lower prices = more games), there are a few reasons why it can be beneficial to buy from a local source such as the two stores on this page: Your money goes directly back into the local economy, keeping other Aussies in their jobs; if there's a problem with the disc or order you can walk into a physical store to sort it out; and you avoid any region-locking hassles.

EB Games Online www.ebgames.com.au

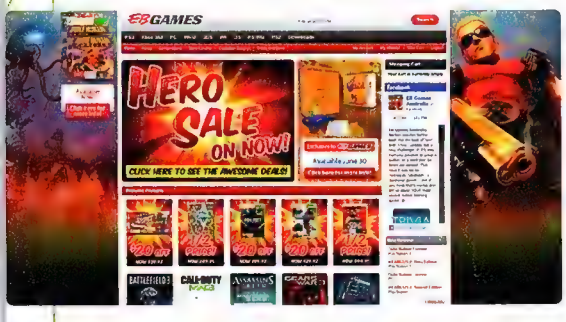
A reliable local store with limited range.

EB Games, previously known as Electronics Boutique, have sold games in Australia for many, many years. They've got prime positions in shopping centres near food courts and other well-trafficked areas, and though they're not known for their fantastic prices, they have been around for quite some time.

The EB Online website is very smoothly coded, with easy access to console categories and relatively convenient genre filters; though the icing on the cake is the search engine's fantastic predictive suggestions. Most anything published in recent years can be found on EB's site, though a disappointingly large volume of titles are only available in stores – making us question why they were listed in the first place. With EB's considerable retail pull comes exclusive 'collector's editions' and other neat offers that can be ordered through the site, albeit at some cost: EB Games was, on average, the most expensive store we covered in this feature.

Times are a-changing, however, and EB Games Online appears to be struggling to keep up with them. The only payment option available is Debit/Credit, leaving those without unable to order. Though HTTPS is used it is an inferior-quality RC4 encryption – an older standard that is better than nothing, but which has been surpassed years ago by AES and other alternatives. Shipping for a single standard boxed title cost an extra $2.50, and our game arrived after three business days in a slightly crushed but otherwise acceptable cardboard box.

With a decent but inconsistent range, generally costly products and a small fee for shipping, EB Games offers decent value only during sales.



Site Security: HTTPS 128 RC4
Prices: High
Payment Options: Credit/Debit
Delivery Time: 3 Business Days

Site Security:
HTTPS 128 Camellia
Prices: Low
Payment Options:
Bank Transfer, Debit/Credit, PayPal
Delivery Time:
Up to 3 weeks

Play-Asia

www.play-asia.com

Great value gaming from the Orient.

If you're fed up with local Australian pricing there are few better alternatives than Play-Asia; they've been in business since 2002, shipping Japanese and American consoles and games across the oceans to our fair shores at decent prices. The Play-Asia website is relatively messy, and its light-brown-text-on-white scheme can make it hard to navigate, but is well worth wrangling.

The gaming section is easily accessible, at least, with weekly specials and recent news taking pride of place at the top. Drilling down into specific consoles and searching for games is easy enough, though if you'd like to browse through their wares for something to catch your fancy it's not the most intuitive system. Handily all the prices are displayed in both USD and AUD, which adds both convenience and complexity to an already messy site.

And what prices they are – Play-Asia were consistently cheaper across major release titles at time of publication, and even offer a handful of games for Dreamcast! Checking out is quite simple, and is protected by excellent HTTPS 256-bit Camellia encryption. Every significant payment option is available, providing the most flexibility of all stores we looked at.

An unfortunate result of Play-Asia's location is that shipping costs range from $4 to $16 for a single item, and delivery times can be as long as three weeks – due to a stocking error in their system our order was cancelled and refunded and could not be included in this feature.

With astounding range and tempting prices, Play-Asia is a worthy contender for your dollars.

HTTPS FTW

Most internet browsing is done over HTTP, which is fine for browsing sites like Wikipedia and Atomic online. Whether you're transferring funds, making purchases, or logging into a service you value, it's good practice to ensure your information is sent over HTTPS – Google, Facebook and Twitter all offer HTTPS connections to protect your data. This encrypts the data between you and the server, and makes it impossible for anyone else to see what you're getting up to.

Site Security:
No Encryption
Prices: Low
Payment Options:
Debit/Credit, PayPal
Delivery Time:
Up to 3 weeks

OzGameShop

www.ozgameshop.com

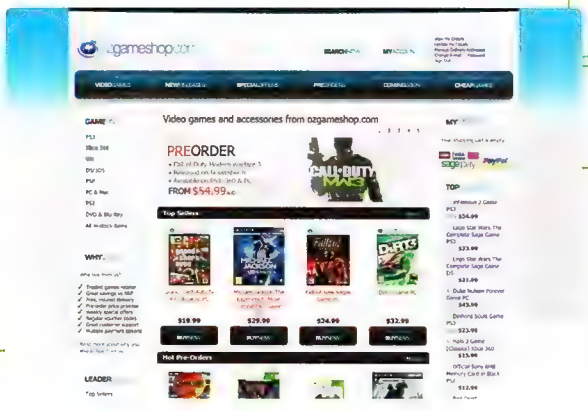
Games from merry ol' England.

With a name like OzGameShop you'd half-expect it to be located within the country, but in actual fact this is a store based in the United Kingdom. As their market also sells PAL games they're offering them to Aussie gamers for cheap; they are very popular with gamers.

The site design is quite clean, with all salient information such as top sellers and specials easily seen at a glance. Searching for titles is great as the search bar predicts the title and offers suggestions, and filtering out specific platforms is simple. There's a nice range of games offered and many in stock, including some games from a few years ago.

Pricing is generally great, and is extremely likely to be cheaper than retail – though in rare cases this is not so, and checking first is always recommended. Payment options on offer are Credit/Debit and PayPal, which is quite flexible. Unfortunately there is absolutely no encryption used when logged into an account or ordering, leaving your personal details snoop-able by those who may be listening, so ordering through PayPal is preferred. Delivery is built into the price, and arrived after 11 business days padded safely inside a cardboard box. This was almost three weeks of real time, so it's only really an option if you're patient and on a budget.

OzGameShop is an okay choice for console and PC games at nice prices, though the savings must be weighed up against a handful of drawbacks.



Steam

http://store.steampowered.com

We would marry Steam if we could.

First launched with Half Life 2 in late 2004, Steam has grown to be the best all-digital platform for PC gamers. With a range that includes most major publishers, a client that manages updates and DLC easily and frequent promotions that keep things interesting, Steam is perhaps the best choice for any PC gamer.

The site design is exceptional, splitting games into different genres (there is notably an indie section, which showcases smaller titles), and allowing filtering by metacritic scores. Searching is predictive, and due to the digital nature of the store, every game listed is available for purchase: even those from many years ago.

Standard pricing is competitive with retail stores, but is not better than Play-Asia or OzGameShop – though Steam is notorious for sales, slashing prices every six months like clockwork and offering daily, mid-weekly and weekend specials. If you buy a game from Steam at full price you're either very uninformed, very impatient, or are buying it at launch. Security is also excellent, using 256-bit AES whenever logging in or purchasing with Debit/Credit or PayPal.

Delivery is through the internet, which can take anywhere from five minutes to an hour based on the size of the game. Some ISPs offer unmetered downloads for recent games, which helps when on a tight quota. Games can be re-downloaded at any time if necessary.

For the money-conscious PC gamer there is little that can compete with Steam's excellent service, frequent sales and convenience.

Site Security: HTTPS 256 AES
Prices: Average
Payment Options: Debit/Credit, PayPal
Delivery Time: Reliant on internet speed

Living Online

With physical discs you know for sure you own a game – digital purchases make it somewhat less clear. Purely digital gaming offers a few drawbacks, such as the inability to sell your games second-hand, and that if your account is stolen or closed by the service you lose your entire library of games. For the most part if you're not cheating or hacking and take basic precautions such as strong passwords you'll be just fine, but it's something to be aware of.

Good Old Games

www.gog.com

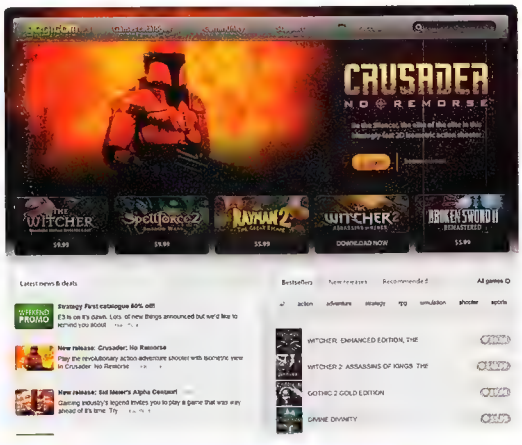
Unmatched resource for older games.

While not a competitive player in the modern gaming battlefield, GOG does offer one recent title – The Witcher 2 – and at time of writing was decently priced. But GOG's main strength is in old games, ones that you've hidden away in a drawer somewhere or have never experienced – all buffed up and shiny, ready to rekindle the love you had for them years ago.

The site design is particularly amenable to this feelgood sensation, with each game page adorned in screenshots and nostalgia. Searching for games is easy with the predictive search, and though the range is quite terrible in terms of modern games, there's plenty to find pre-2002. In addition to the game files, which are typically all certified to work on 64-bit operating systems, GOG throw in extras such as soundtracks and wallpapers to sweeten the deal.

Pricing is fine for older titles, and a recent trend toward frequent sales mean great games can be picked up for a couple of bucks each. It's a fully digital service, offering HTTPS encryption with 256-bit RSA, and the usual selection of payment options. Delivery is through the internet, though unlike Steam is not unmetered with any ISPs – keep this in mind when ordering any games. The file size is helpfully listed on each game page.

GOG has the potential to be a player in the modern gaming scene; but for now it's just a fun option for nostalgia's sake.



Site Security: HTTPS 256 RSA
Prices: Low-Average
Payment Options: Debit/Credit, PayPal
Delivery Time: Reliant on internet speed

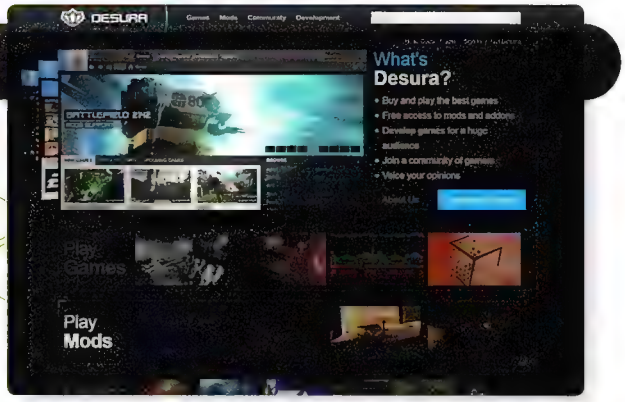
Worth a look-in

Amazon UK www.amazon.co.uk

Amazon has a decent selection of games at prices that range from quite good to poor, has been around for many years and is very reliable. Shipping generally takes two weeks from our anecdotal experience, and PAL games for most major consoles will work fine: it's always worth a quick search online for confirmation beforehand. Payment is limited to Debit/Credit only.

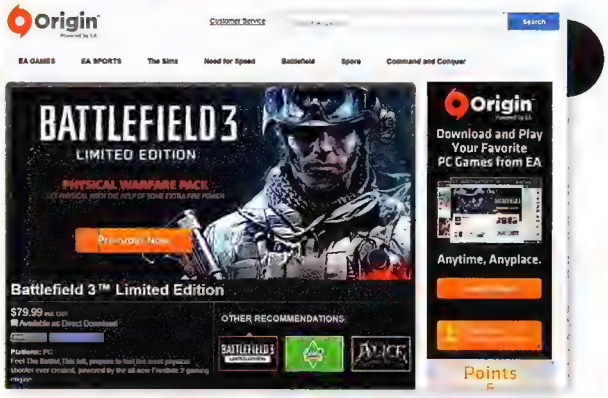
Desura www.desura.com

Desura has a selection of mostly indie games for sale at prices set by the developers; generally these are much higher than Steam prices, and exceptionally higher than Steam sale prices. However, this service is best for game mods – they can be browsed and managed through the Desura installer, which also manages mod updates. A very convenient way to discover new content to extend the life of your games.



Origin http://store.origin.com

Formerly the EA store, Origin is exclusively tied to EA's catalogue and therefore does not offer a large range of titles. Pricing is generally quite high. The upside to Origin is that you're quite likely to be able to re-download your game as long as EA is in business. Some games such as Crysis 2 are only available digitally through Origin, and all copies of Battlefield 3 on PC will require the service.



When and where should I buy my games?

It's hard to argue that local retailers have great prices – in every case they were the most expensive of the six stores we compared. However, each of the stores have their own upsides and downsides for different situations. For example, if you're buying the latest release it may be just as expensive to buy it locally as it is to buy digitally; even moreso for collector's editions. We'd be more than happy to recommend you buy these sorts of titles from local retailers, as you'll get your game quickly and at a fair price.

But if the game you're looking at buying has been around for more than a few months, there are very few times where local retail – even when ordering online – is the best answer. Stores like Play-Asia and OzGameShop, though they come with long shipping times, offer great prices. You've already waited a few months, so why not wait a little longer to get a significant discount? Digital stores are our favourite choice of all, however, as the convenience and speed typically outweigh the lack of physical packaging. No matter the store you choose to buy from, we'd recommend you keep these key points in mind:

- Compare prices between multiple stores before comitting to buy to ensure you're getting a good price
- Bide your time and purchase during sales to get better value for money
- Always take security measures such as ensuring HTTPS connections and consider SMS security codes

We recommend Steam wholeheartedly for its frequent sales and convenience as the first choice for PC gamers; consolers will be equally well-served by Play-Asia and OzGameShop. Bring on the savings!

Deus Ex: Human Revolution

Almost the greatest game you'll play this year.

During our time playing Deus Ex: Human Revolution, we've been thinking "Man, can a game get any better than this?" At those moments, phrases like 'game of the year' and 'best RPG shooter ever' keep running through our minds. At its best, there is simply nothing quite like Deus Ex: Human Revolution.

However, there's also an 'at its worst' side to this equation. For every highpoint of our tens of hours with the game, there has been at least one terrible low. There are bugs, there are AI glitches, and there is some truly terrible voice acting.

So how does this long-awaited and much looked-forward to game add up, or does it leave it up to lady luck? Good question...

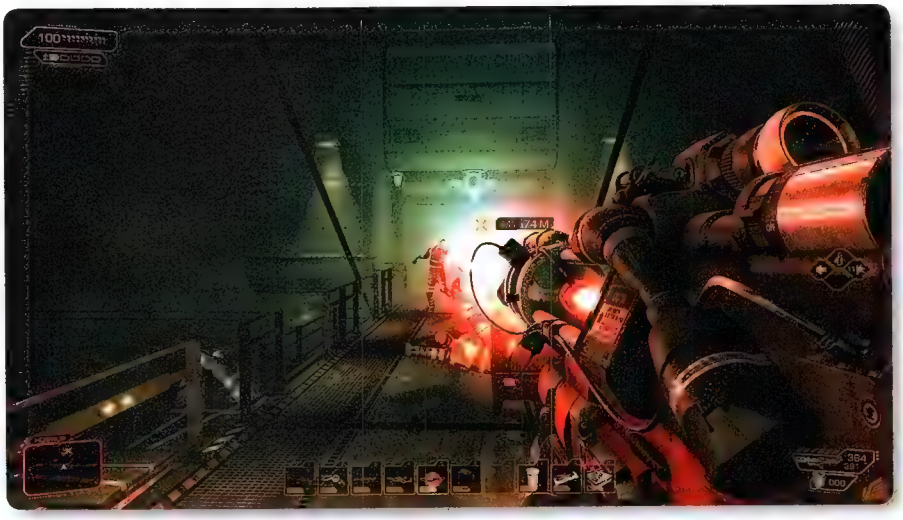
Well, do ya, (cyber)punk?

At its heart, DX:HR is a simple tale of one man's search for truth and revenge, following the death of his lover. But there's so much more layered on top of that – high end corporate espionage, government conspiracies and even BIG QUESTIONS™ over what it means to be human, the power of the media and the ethics of experimenting with the progress of human evolution... Jensen's story is really only a small portion of the experience.

That a 'mere' computer game is not only posing these questions, but doing so in such a bravura and mature manner, is marvellous. Also, for the most part, the game always strives to match its heart with clever gameplay, involved mechanics and choices that not only matter, but that change the game entirely.

So let's talk about when it works.

Probably the main mechanic of the game is the fact that during the prologue, you – as Adam Jensen, security chief for the forward looking Sarif Industries – get the ever-living crap beaten out of you. In fact, were it not for top of the line augmentations and cyberlimbs installed in your beaten husk by your employer, you'd be dead. Jensen pretty much goes from baseline



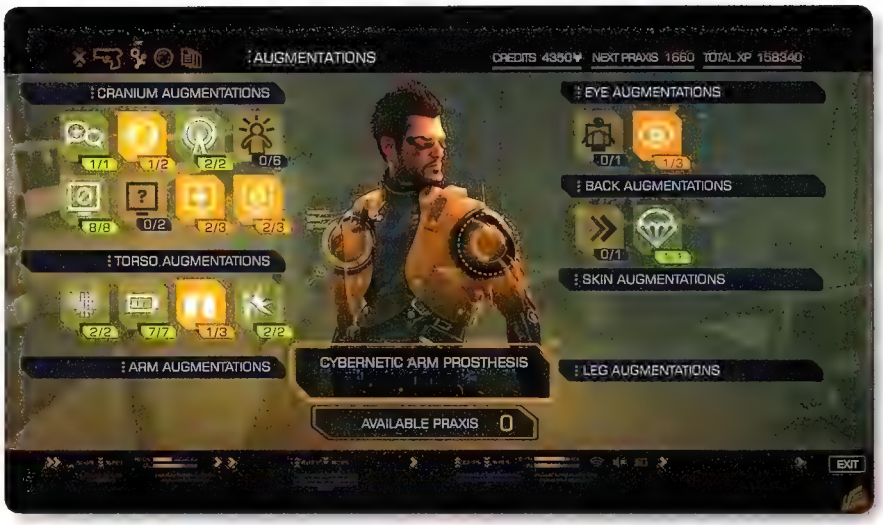
DXHR Second opinion

Unlike our illustrious editor, I played Deus Ex: Human Revolution on Xbox, with full retail code. And equally unlike our illustrious editor, I had a remarkably glitch-lite experience while playing a game that, for me, bordered on the near perfect.

(I wish I could have said glitch-free, by the way, but I did have one system crash that could be explained by the poor old Xbox getting its geriatric feet tangled in its Zimmer frame and one remarkably irritating issue where my Wall-Penetrating Imager would just refuse to work occasionally.)

But I have to say that even if there had been more regular glitches, I think I would have happily tolerated them – ala Fallout: New Vegas – simply because of the excellent gameplay. At all times during DXHR I felt a very active participant in the events. I felt that the decisions that I, as Adam, made – even the bad ones – were truly mine. And I loved the capacity to change gameplay elements on-the-fly: I found myself stealthing through some areas, then slaughtering everyone in the next (on a mere twist of Adam's whim of course), just because the game is adaptive enough to let you do that.

In all, I found a game that, like Red Dead Redemption and the last two Fallout titles before it, ticked nearly every box for me. Deus Ex: Human Revolution flies tantalisingly close to the burning sun of perfection, without softening the wax of its wings. **NH**



human to full Cyberman during the credits – a sequence that's very reminiscent of the anime cyberpunk classic, Ghost in the Shell.

But all those new toys can't be turned on at once. It's reinforced throughout the game that augmentation comes with a price – tissue rejection, infection and so on – so as you play, you get to choose which systems to activate. Basically, it's a classic XP-buy system, but one that's very cleverly tied directly into the player's experience of the world. The powers are all universally useful, too, and allow you to pretty much tailor Jensen to match how you want to play the game. That said, there are some real no-brainer choices, and we can't escape the feeling that anyone who chooses not to employ hacking will be severely hindered as they move around the game world.

And wow, what a world. Eidos has managed to create a range of environments that each feel more real, and at the same time, more impressive than the last. Hengsha, for instance, is a great two-level Chinese city, with the poor living under an artificial sky that supports an upper level of green parks and corporate enclaves. There are signs, posters and advertising everywhere, making each location feel almost alive. Sure, the inhabitants of these places are mostly static, and Human Revolution certainly lacks some of the scripted events of the former titles. That said, huge points to Eidos's art team.

Bang, stab, hack – you're dead

In true Deus Ex style, combat is largely avoidable (with a few boss-fight exceptions) if you take the right augs and explore your environment carefully. The stealth gameplay, which uses a crouch-to-sneak function, is enhanced by various augs that let you turn invisible and move quietly, which is very satisfying. And it's great to play a game that simply throws badguys at you when you get discovered, rather than calling mission-fail.

When combat does start it's mostly satisfying, but because the game features a lot of shooting augments (for accuracy, mobility and recoil), it's initially bland. Put the time into becoming a true gunman, though, and you'll be headshotting and leaving an array of corpses behind you. However, the game is not without some glaring issues.

A flawed gem

Reviewing a game as complex as Human Revolution is always tough, and so far we've not come across anyone else who's had the issues we've had – but we can still only review the game we've played. So far, we've had a number of complete lock-ups, a sidequest that we could not complete at all thanks to a weird dialogue bug, and many, many instances of AI friendly fire – and not the useful kind, either. We mean the kind where one guard keeps shooting another, and that other guard not only not dying, but not reacting at all.

In fact, that AI can be one of the big immersion breakers of the game. In one level we tripped a security alarm and got into a big gunfight, while scientists scrambled to get to safe-rooms. However, once we snuck away, and the alarm subsided, the scientists got so relaxed with our armed presence that they simply went back to work. While we were using them as cover. "No, no, don't mind us guys..." BANG!

Aside from the failure-to-complete (and the game has a quest hub system that precludes ever going back to earlier hubs and quests), these are minor niggles, but they do keep the game from reaching the stellar heights we'd been expecting of Human Revolution. At the same time, while some of the voice-acting is great, there are other bits which are truly wince-inducing, and don't get us started on the lo-res pre-rendered cut-scenes. We could just about forgive that on a console title, but at PC resolution it's just such a crime to see these detailed characters and settings reduced to a brown, muddy mess.

Good, bad or...

It's quite interesting, really, to compare Deus Ex to Fallout: New Vegas, or even Mass Effect. There are a lot of similarities, especially between Human Revolution and the former. Both are big sprawling games, but are essentially (to us, at least) buggy experiences. But something about DXHR's is much more infuriating. In all honesty, we never really saw too many bugs in New Vegas; those we did were more amusing than anything else. But when you can't complete a whole questline (and one that's personally very important to the main character) it just gets frustrating. Doubly so when some storylines depend on their completion (or a lack thereof) and can come back to you haunt you.

Deus Ex: Human Revolution is undoubtedly a grand experience, and an epic game. As a PC title, it's also a more or less fully functional entity, and with DX11 hardware and all the bells and whistles ticked, there's certainly nothing else that looks this good. But for all that 'grand experience', it's still an annoyingly flawed one. It's a game we wholeheartedly recommend, but make sure you save your game early, and often. **DH**

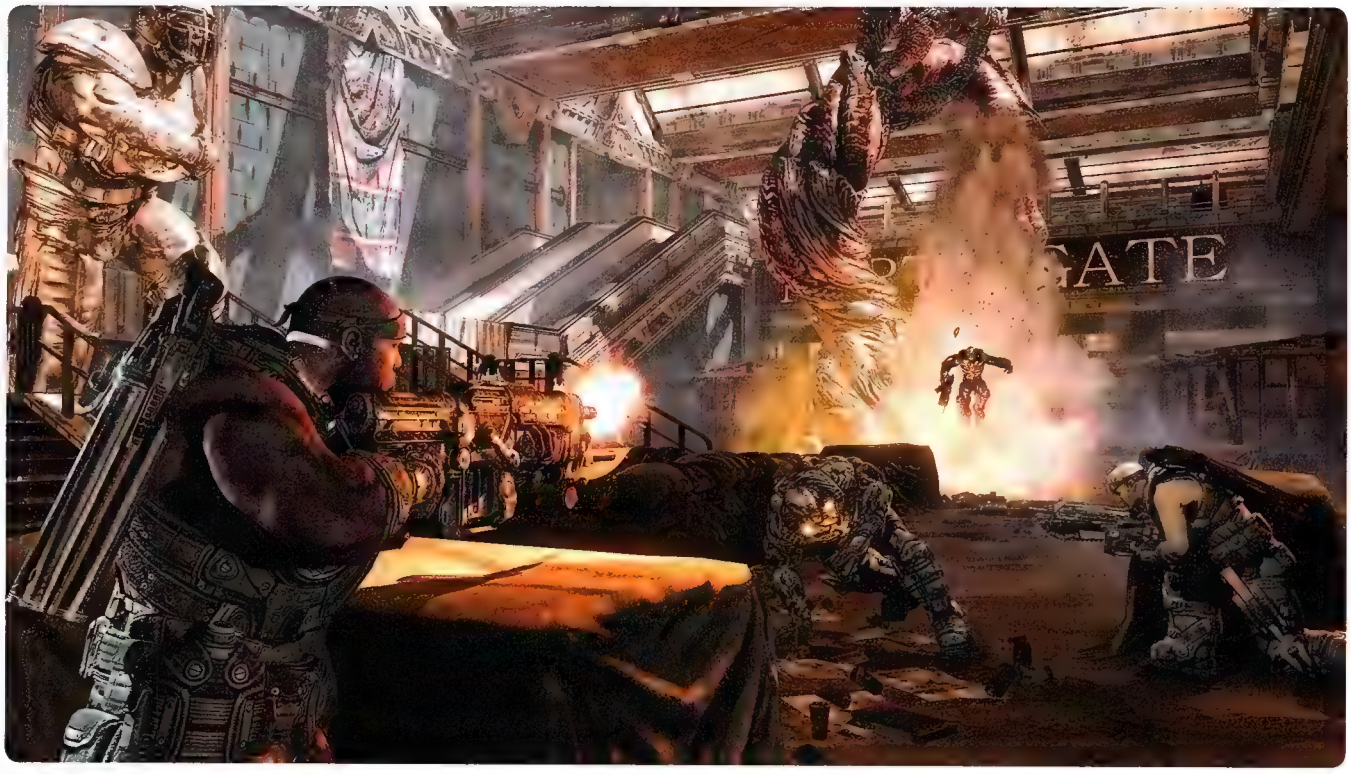
PC, Xbox, PS3 (reviewed on PC)

Developer Eidos Montreal/Nixxes Software
Publisher Square Enix
Website http://www.deusex.com/

Gameplay Deep, but a touch buggy.	86
Graphics Brilliant for hardcore rigs with DX11 and Tessellation.	97
Sound Awesome soundtrack; mixed voicework.	80

Overall An outstanding, yet flawed effort at reinventing one of the greatest PC games of all time.

89%



Gears of War 3

It's full of big men, with big guns, killing lots of stuff. So... perfect Gears, right?

You know, for a franchise as big as Gears of War, we had a helluva problem leading up to our preview session. Namely, we couldn't find anyone to head along to Xbox HQ to actually play the thing. The reason we wanted to dodge it ourselves is because of, well... we really can't stand Gears of War.

Now, you might be howling with rage right now, but seriously, if there are two kinds of people in the world – those who like Gears and those who would rather gargle toilet water – we're in the latter category. And, it appears, we're not alone. No one in our office seems to like it, so perhaps there's some massive disconnect in play; maybe we're missing a part of our soul, or maybe we're just not really, ahem, proper console gamers. Regardless, we ended up stuck with the duty. To that end, we're going to try and look at our preview – a bit of co-op and the first few hours of the campaign - from the point of view of a Gears noob, and look at why this might be the game that changes your mind.

So, is it?

Oh hells no.

Look, I know that Halo isn't exactly War and Peace, but at least there's a hint of emotional depth and pathos involved. With Gears – and Gears of War 3 is no exception – it's all bulging beefcake and pissing contests, combined with a plot (or what we laughingly refer to as a plot, anyhow) that's only a little more well-constructed than your average Michael Bay film.

Now, bear in mind that we're no experts of the Gears backstory, but also bear in mind that I don't think really matters.

The game kicks off with Marcus Fenix having

a dream about his dear-departed father; it's basically your classic low-stakes training level. There's some left over guilt that Marcus is dealing with after letting his dad die, and now he wants to... yawn. I might care, if Marcus were at all likeable, but I've always found him to be a depthless cliché at the best of times (with enormous, armoured man-boobs). And like I said, he makes the Chief – the ultimate in faceless characters – seem like your oldest and dearest buddy by comparison. Marcus seems to be surrounded by the usual surly crew of rednecks who'd give their life for him, but I am flummoxed to work out why.

From there we discover the last remnants of humanity, all floating along on a naval convoy. Then, at last, we get into the proper meat of the game – blowing the crap out of things while hiding behind an abundance of conveniently placed chest-high walls.

One of the issues we've always had with cover-based shooters is that you can always tell how any given level is meant to be cleared. It's right there in the angles of walls, crates (ah, the crates – where would gaming be without 'em?), and exploding barrels. You could try and bring a sense of tactical innovation to the party, but then, chances are, you'd die. Instead it's fire, advance, flank, kill every time, with the occasional melee kill to break it all up. Gears 3 even tempts you with hints of multi-path gameplay, with choices over things like splitting your squad and taking different routes to target, but these moments are over in a flash and usually lead to the same spot inside of thirty seconds anyway.

There's a hint of cleverness, however, when you get to effectively replay the first hour or so of game, only this time from the point of view of the squad that showed up at the end of that first stretch to save the day. It's a hint, but less of a one when you realise that after three hours of exploding gore and numbing machismo, you still haven't really advanced the plot. All the hooks that were introduced in the first half hour are nowhere cl oser to being answered or resolved, and it's this that makes me think Gears does not so much have plot, but rather a sketch of a plot, and lots of things getting gibbed by chainsaws in between.

But hey, we could be wrong. Maybe the game reaches heights of gameplay perfection right after the preview code we played ends.

The thing is, though, we know we're more or less in the minority. On the console, this game is a mega-smash hit, though one thing does occur to us; at the risk of sounding elitist, there's a reason that the first game was the only one of the series to be released on PC. It's just not a PC shooter, and as PC gamers first and foremost, it's no surprise we don't like its rather stripped-back and bombastic approach to the genre. In an age when even id is putting RPG elements into its shooters (and no one's more traditional than id when it comes to FPS), Gears refuses to be anything but brutally simple and one dimensional.

Who are we to argue with sales? **DH**

Xbox 360

Developer Epic Games
Publisher Microsoft
Website www.gearsofwar.com

✓ Fast and frenetic; brutal weapons; smooth framerate.

✗ Marcus Fenix is a jerk, so are most of his friends.

Anticipation rating

We're really not the right people to judge this...

71%

Battlezone

Ben Mansill is in the zone. The Battlezone. Where the heck is everyone else...?

One of the saddest mysteries in gaming is why the holy heck Battlezone didn't explode into a massive ongoing franchise. It managed to get an expansion pack and a sequel, but that's where it ended.

This was 1998. 3D was mature, both from a development perspective as well as hardware. Game design was trending towards the handful of genres we're left with today. Both Battlezone games were at the forefront of the scene, technically and creatively. They were beautiful, they were fresh, they were bloody fantastic.

A couple of months after Battlezone 2 was released I visited the offices of Pandemic, the LA-based developer that did the games under Activision's umbrella. By then the game had flopped in the market and the guys were devastated. They'd come up with a game style that fused FPS with RTS, and done so beautifully. They had believed in its future. This was a 'critically acclaimed' series with high scores across the board.

The brains of the outfit was an Aussie, Andrew Goldman, who'd previously played a major role in creating Dark Reign (almost certainly more about that in a future column!). Andrew was gutted, as were we all, and in equal parts, mystified. It just didn't make any sense.

The common theory is that the gameplay was just too much for gamers to handle. FPS gamers wanted simple running around and shooting, while RTS gamers wanted to be a Commander at a distance. It's all bollocks – the game was easy to play, it satisfied deeply with base-building and resource management fulfilment, and the in-cockpit action was sublime – though at times tensely paced.

It went a little something like this: you'd start on a planet – beautifully rendered, atmospheric and moody – scoot about in a light tank and order the construction of your base buildings by pointing the cursor at the spot you fancied. The RTS construction flow was exactly the same as any good game of that genre. Start with a construction yard, build resource gatherers, build better unit factories, build tower defences, invest in advanced unit and weaponry structures. Etc etc. That aspect was perfect, and you'd think that it'd be easily accepted by a gaming world that, at the time, was hooked on Command and Conquer and Warcraft.

Meanwhile, off on the other side of the map, the AI was doing the same – so it had that vital ingredient all great RTS games needed of needing a near-perfect build sequence to be in the fight. But unlike top-down RTS games, this need for efficiency was sexed up by the need to recon from the ground in your tank to determine the optimum building placement arrangement, and then dash about so you'd be in position to actually put them where you wanted.

The other half of the game was combat, and again it played out just like a good RTS. Early probing missions by light units, a bit of turtling, then a big fight with advanced units. You'd attack the edge of the base first, taking out defences, or perhaps the power generators that powered them, before pushing deeper and taking out critical structures. You'd take losses, for sure, and that was neat. Ordering units in you'd assault in a full charge, looking left and right, admiring the fleet of hovertanks, heavies, and even Mechs and air, that you'd painstakingly built, then watching them fight and die. Your own tank would inevitably cop a hammering and the strategy was to either back off when damage was in the red for repairs, or eject and take command of a healthier unit to become your personal chariot.

But unlike top-down RTS games, this need for efficiency was sexed up by the need to recon from the ground in your tank...

Thing is, it wasn't a game of two genres. It wasn't two styles you played simultaneously. The brilliance was that Battlezone was an all-new genre unto itself. The developers created a masterpiece of originality, and gamers *should* have enjoyed a deeply absorbing experience. But they didn't: and Battlezone died.

Well, as I recently discovered it's actually very much still alive. Just a few weeks ago a mega patch was released for Battlezone 2 by dedicated fans (**http://matesfamily.org/bz2/**). It's the latest in a long string, but the new 1.3.6.2 version is the big one. It fixes some multi-player bugs and various small tweaks, but the big thing is that the game now runs just beautifully on a modern system. As it should. At a huge res you can reliably expect a bazillion frames per second.

I've now played dozens of hours on it, re-discovering the majesty of the design. It's bloody tops. If you have an old BZ2 CD buried somewhere – please – do yourself a favour and give it a fresh go. Once you've played the masterfully crafted single-player campaign, seek out the many awesome community mods and maps. Sadly BZ2 isn't on Good Old Games yet, but there's a single copy available on Amazon at the time of writing. Maybe if the millions of Atomic readers get into it enough Activision will do a new game. A boy can dream...

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